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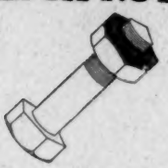

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EDITORIAL
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The Signal Division Attendance

The first meeting of the Signal division of the American Railroad Association was successful to the point of exceeding the most earnest hopes of those in charge, in so far as attendance was concerned. Perhaps this success might be attributed to the recent amalgamation with the A. R. A. and the desire of signalmen to see the actual results of this change; perhaps it was due to the shifting of personnel in the signal field during the past year or it may be the result of the uncertainty as to the fate of the railroads themselves, or the natural desire of all railroad men to exchange views on the subject. Whatever the cause, the fact remains that signalmen of all classes are taking an active interest in the conduct of the old Railway Signal Association this year and its new relations with other associations and with the railroads. Definitely, the registration yesterday showed there were 319 members of all classes in attendance as compared with 198 last year, an increase of 121 members.

Railroad Administration Helps Conventions

The higher officers of the Railroad Administration have taken a very broad and intelligent view of the value of the conventions of railroad associations and of the exhibits of equipment and supplies made in connection with them. The regional directors, with the sanction of Director-General Hines and Director of Operation Tyler, sent out circular letters to the federal managers instructing them to cause as many of their engineering and maintenance officers to attend this year's Railway Engineering Association convention as could be spared from their other duties. Director-General Hines intended to be a speaker at the association's annual banquet on Wednesday evening, but will be prevented by pressure of work in Washington. Director of Operation Tyler intended also to attend the dinner, and it is still hoped that he will do so. It is probable also that some of the regional directors will be present. Formerly, under private operation, the executive officers of the railways did not take as much interest in and give as much encouragement to the meetings of the important association and the exhibits in connection with them as was desirable in the interest of the greatest efficiency of operation. The greater recognition given to the conventions by the higher officers under government control should cause gratification; and it should be continued after the railways are returned to private operation. Never in the history of America was there such need of the greatest attainable efficiency and economy of railway operation as there is now. The increased efficiency and economy needed must be attained, if at all, chiefly by means of the use of methods and devices which will save labor. The conventions of the technical associations and the exhibits given in connection with them afford among the very best means available for developing methods and seeing devices intended to increase efficiency, and especially to increase it by saving labor. The Railroad Administration is rendering a good service to the railways and the country by giving the conventions and exhibits its powerful support.

The A. R. A. Signal Division and the War

At this time a year ago the Railway Signal Association, now the Signal division of the American Railroad Association, held its meeting under decidedly different conditions than exist at present. The winning of the war was then the all-important factor. Practically no one at that time believed that the enemy could be forced to lay down his arms as soon as he did. Every thought, every act, in fact, everything that was done had therefore the one purpose in view—that of making victory possible. The R. S. A. did its bit; its records show that a number of its members joined some branch of the military or naval service. These men, some of whom have already returned and again engaged in their former occupations or other civil pursuits, have had experiences which they can look back upon as mile stones in their lives, which bear inscriptions of service and of which they can justly feel proud.

The railways of France, Belgium, Italy and the other countries in the fighting zones had to be operated and maintained in order that military operations could be carried on to the fullest extent. In that connection the signal engineer is as essential as he is in civil life, likewise the men under his leadership. In that capacity at least three of the R. S. A. honor roll men have served as officers or in the ranks of engineer companies in the field; still others in supply units, and in the forces at the fighting front. On another page is an article describing the activities of various members in the war. However, the struggle is over now and these men are returning with only a memory of the past. Some will undoubtedly renew their former activities and re-establish their standing under new conditions. As far as association work is concerned they will have to adjust themselves to the newly created Signal Division of the American Railroad Association, which adjustment will depend largely upon the spirit with which all members enter into the reorganized A. R. A., and must assume the responsibility for the success of all activities relative thereto.

The A. R. A. and Other Associations

In the reorganization of the American Railroad Association many of the technical railway associations are being merged with it. The discussion of the reorganizations at the meeting of the Railway Signal Association yesterday was one of many illustrations of the fact that there is by no means entire unanimity among railway officers regarding the effect on the work of the various railroad associations that the merger with the American Railroad Association is going to have. The determination of whether the change will have a good or a bad effect will be made chiefly by the American Railroad Association itself. The old American Railway Associa-

tion was criticised a great deal because, as was alleged, it did not assume its proper responsibilities and perform its duties. To a large extent this criticism was just. The way in which the American Railway Association conducted its business rendered it impossible for it to be an efficient and effective organization. Almost all its work was done by its various committees, including the executive committee. Its semi-annual meetings usually were perfunctory affairs. They ordinarily did not last more than three or four hours, and there was almost no discussion on the floor. The disposition of the reports recommended by the executive committee almost always was adopted in steam roller fashion.

In consequence, there was not the full and intelligent consideration of the various problems with which it was the duty of the association to deal that there should have been. Furthermore, the association ignored many problems with which it should have dealt. Finally, it failed to adopt means of giving general effect to the standards and recommended practice which it adopted.

If, after having assumed a wide control over the work of organizations in the engineering, mechanical, signaling, transportation and other fields, the American Railroad Association should transact business in the same way that the American Railway Association has in the past it will not only fail to accomplish anything substantial itself, but it will also prevent the organizations over which it has taken control from accomplishing as much as they have in the past. The members of the new American Railroad Association must make it an organization worthy to exercise the suzerainty over the other organizations which it has adopted. In order to do this it will be necessary for the American Railroad Association to meet at least twice a year, to continue its meetings through at least two days instead of through only three or four hours, and to adopt effective means of getting the railways to carry out the standards of practice which the association shall adopt. While the railways are under government control it will be the function of the director general to give effect to the association's decisions, but probably the A. R. A. will outlive the Railroad Administration.

By co-ordinating the work of the various technical organizations much good can be accomplished, but whether the good that can be accomplished actually will be accomplished remains to be seen.

Effect of Passing Sidings on Capacity

AMONG THE PROBLEMS that confront many of the railroads today is that of increasing their capacity. Some lines are experiencing serious delays in moving trains, when, if the facts were known, a large portion or all of the difficulty might be eliminated. In connection with such problems Committee 10 of the Signal division of the American Railroad Association has made extensive investigations. Several years ago this committee, then known as Committee 1 of the Railway Signal Association, was assigned the work of making a study of the problems of signaling single track roads and of determining the influence of the proper location of passing sidings on the capacity of lines. As a result of such investigations, the committee one year ago, then known as Committee 10 of the R. S. A., submitted its report on the above subject to the association as information. Since then it has continued its study with a view of amplifying and analyzing the same problem when applied to two or more tracks. These studies have been combined into the report that was submitted at yesterday's meeting of the Signal division of the A. R. A.

Comparing the analysis of the single track with that of two or more tracks, it is evident that the problems are quite different even though time in both cases is the controlling factor in determining the number of trains that can be operated between two points. In the first case opposing trains are dealt with, while in the second case the predominating factor is following trains, with occasional layouts of opposing traffic on one or more tracks. The problem of the proper location of passing tracks resolves itself into an analysis of the particular layout under investigation, and the quantity and type of traffic involved. However, fundamental formulae can be applied to the various conditions and simple rules can be followed which will aid in the work of increasing the capacity of the roads.

For instance, it is quite evident that the location of passing tracks which will result in the minimum amount of delay to freight trains which are to be passed by passenger trains, will be their location so that the spacing between freight trains will be equal to the difference in running time of the freight and passenger trains between sidings. Other factors, of course, enter into a study of the capacity of the roads, such as signaling, and interlocking, additional main lines, etc. A comprehensive study was made of a piece of existing road in accordance with the prescribed method of analyzing multiple track lines, which would result, if proposed plans were adopted, in a reduction of 30 to 70 per cent in the interference on main tracks for freight service and an increase of 35 per cent in the number of freight trains that could be handled at exceptionally restricted points, besides a considerable reduction in the time required in moving over a division owing to a reduction in delays. The decided effect that the proper location of passing sidings, as well as proper signal and interlocking conditions, may have upon the capacity of main tracks is worthy of the most careful consideration by the railroad officers in charge of operation and if the analysis shows that a material increase can be effected at a cost that can perhaps be compensated for, in a reasonable length of time, the cost should be incurred.

The Future of the R. S. A.

THE FUTURE OF THE Signal division of the Engineering section of the American Railroad Association will depend largely upon the attitude assumed by those comprising its membership. The old Railway Signal Association retains its original membership, among whom are those who have in the past been instrumental in advancing the association to its present high plane.

Excellent work has been done by the R. S. A. in the development of standards and practices for the signal field —a field assuming greater importance each year. It will be essential that the same or greater enthusiasm exist among the members in future in order to accomplish as good or better results as they have in the past. The Railway Signal Association having been a voluntary organization, has had its work largely carried on by voluntary efforts of the members, who have devoted to it such time as their duties permitted. Under the new organization the members, as representatives of their roads, will feel free to give the time required to committee work. This should tend to cause more and better work on their part. As the business of the Signal division will be carried on in the future as was the business of the R. S. A. in the past, the affiliated members will still have an important voice in the affairs of the division through committee assignments, and on the floor of the meetings, although they will not be privileged to vote by letter ballot. The enthusiasm and activities of the affiliated members in the

future will depend to a great extent upon the attitude of the representative or voting members. If the affiliated members find that their suggestions and activities are received with indifference their enthusiasm will be reduced and eventually killed, and the good results obtained from their work during the last 24 years will be lost.

Much good may be accomplished if more definite specifications are adopted in the future than has been the case in the past. In order to accomplish this each member should consider carefully what will be of the most benefit to all the railways, and not merely to his railway. There may be a tendency on the part of the members to restrict the expression of their views under the new organization because, as part of the American Railroad Association, they will be governed largely by the wishes of their superiors, while under the old R. S. A., as a voluntary association, they were not under this restraining influence. When a man gets up to voice an opinion in future he is apt to reflect the policy of his road, and for that reason he may be ultra-conservative. It is to be hoped, however, that the members will continue to express their personal opinions on their experience.

The dues of the members entitle them to the literature published by the division. A digest of the proceedings has been issued each year in the form of a bound volume. Such a digest is of great value to all interested in this branch of railroad work and should be continued, as the information so presented is in handy form for quick and ready reference.

A very spirited discussion took place after an outline of the work in connection with the amalgamation was presented to the meeting yesterday. It would appear desirable that signaling should be given a separate section of the A. R. A. instead of being made merely a division of a section.

The Annual Dinner

Tickets for the annual dinner of the A. R. E. A. will be on sale in the corridor in front of the convention hall at the close of the morning session today. In view of the expected large demand for tickets those planning to attend are urged to secure their tickets as early as possible. They are sold at $3.50 each. In view of the long program a special effort will be made to seat the guests promptly at 7 o'clock.

The speakers at the dinner will include United States Senator Atlee Pomerene, of Ohio, who will speak on "Some Phases of the Railroad Question;" Dr. George Adam, pastor of Emmanuel Congregational Church, Montreal, Quebec, who will speak on "Language and Ideals;" Hon. Clarence N. Goodwin, of Chicago, whose subject will be "Americanization in Connection With Maintenance of Way Labor on Railroads," and Robt. J. Cary, general counsel New York Central Lines, at Chicago, who will take for his topic "Noblesse Oblige—Our New Nationalism." Senator Pomerene is a member of the Senate committee on Interstate Commerce and has been present at all of the recent hearings at which the various solutions of the railroad problem have been presented. He is, therefore, particularly well qualified to discuss the subject.

A.R.E.A. Board of Direction Meeting

A meeting of the board of direction of the American Railway Engineering Association was held in the English room of the Congress Hotel at 10 o'clock yesterday morning where a four-hour session was spent in the transaction of routine business and the completion of plans for the convention. For the first time in the history of the association all of the 19 members of the board of direction were present.

Secretary Fritch's Two Sons in Service

Secretary Fritch was much gratified to receive a message last Thursday from his son E. J. Fritch, announcing his safe arrival at Newport News from service overseas. He was a sergeant in the 75th regiment, Coast Artillery. Mr. Fritch has the distinction also of having had another son in the service, L. C. Fritch, who was in the medical department and who has received his discharge and returned to school.

Hu and Wu

Among the recent members of the American Railway Engineering Association are T. C. Hu, chief technical secretary of the Chuchow-Chinchow railway, Peking, China, and Da-Chang Wu, formerly structural draftsman with the Santa Fe, who has recently returned to China.

The A. R. E. A. Convention Program

The Twentieth Annual Convention of the American Railway Engineering Association was called to order at 9:30 this morning and will continue in session until Thursday afternoon. The sessions will convene at 9:30 a. m. and 2 p. m. Following the address of the president and the reports of the secretary and treasurer, the reports of standing and special committees will be presented as follows:

First Day—Tuesday, March 18—
- Signals and Interlocking.
- Signs, Fences and Crossings.
- Conservation of Natural Resources.
- Track.
- Records and Accounts.
- Rules and Organization.
- Economics of Railway Labor.

Evening Session—
- Illustrated Use of Labor-Saving Devices.
- Developments in Study of Transverse Fissures.

Second Day—Wednesday, March 19—
- Wood Preservation.
- Yards and Terminals.
- Electricity.
- Ties.
- Stresses in Railroad Track.
- Buildings.
- Ballast.
- Roadway.
- Rail.
- Annual Dinner at 6:30 p. m.

Third Day—Thursday, March 20—
- Iron and Steel Structures.
- Masonry.
- Water Service.
- Wooden Bridges and Trestles.
- Uniform General Contract Forms.
- Economics of Railway Operation.
- Economics of Railway Location.
- New Business.
- Election and Installation of Officers.
- Adjournment.

Signal Division in Session

Stated Meeting of Signal Division of the A. R. A.

First Session Held Under the Changed Conditions— Abstracts of Reports With Discussion

THE MARCH STATED MEETING of the newly-created Signal division of the American Railroad Association was held in the Auditorium hotel, Chicago, on Monday, March 17. The morning's session was called to order at 9:55 a. m. by President R. E. Trout, signal engineer, St. Louis-San Francisco, and adjourned at 12:45 p. m. The meeting re-convened at 2 p. m. and continued until 7 p. m.

The first order of business was the approval of the minutes of the last meeting. As there was no unfinished business the new business before the Association was taken up. In this connection the circular letter covering the conditions leading up to the change, dated February 24, which had been forwarded to all members of the Association, was read.

The Secretary stated that beginning April 1 new members enrolled would be classed as affiliated members. Members who are railroad men and who have not been appointed by their railroads as members of the Signal division of the American Railroad Association will be required to pay $3 per annum as dues. Others not railroad men who are admitted as affiliated members will be required to pay $6 per annum. Up to April 1 the dues will be as they were formerly and members will be accepted in the association under the old arrangement until midnight March 31, 1919. The secretary stated that the securities of the association and the loving cup had been transferred to the care of the secretary and were held in trust. The secretary stated that the Committee on Direction, at a meeting held March 16, decided that the June meeting of the division will be held at Atlantic City, June 26 and 27. This time it was also decided to hold the annual meeting in Chicago on September 17, 18 and 19, 1919.

The regulations for the Signal division of the A. R. A. as of March 16, 1919, were then read. It was moved and seconded that these resolutions be accepted and this motion carried. The handling of committees in the future will be the same as in the past except that, on proper notice, the secretary will be present in person or assign some one to act as recording secretary for the meetings. A resolution was presented before the meeting that it was the sense of the division that they be organized as a separate section of the American Railway Association.

After reading this resolution a number of points were brought out by members with reference to the effect the proposed change would have on certain meetings and upon the actions of the division. The resolution and the discussion covering these points is given below.

The secretary submitted the following resolution:

WHEREAS, The Signal Division of the American Railroad Association desires to be of the utmost value to the United States Railroad Administration and the railroads, and,

WHEREAS, The Division includes in its membership many officers occupying positions in the Signal departments of the railroads which are distinct in character from those of any other department, and,

WHEREAS, The inclusion of the activities of the Signal Division with those of any section of the association will prevent the rendering of the most efficient and valuable services, therefore, be it

Resolved, That the Committee of Direction of the Signal Division be instructed to bring to the attention of the executive committee the necessity and desirability of the creation of a separate section to cover the activities of the Signal Division.

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Resolved, That the Committee of Direction of the Signal Division be instructed to bring to the attention of the executive committee the necessity and desirability of the creation of a separate section to cover the activities of the Signal Division.

(On a motion, duly made and seconded, the resolution was adopted.)

L. R. Mann (Mo. Pac.): Wouldn't it be well to say what the alternative would be, in case this does not come into effect?

T. S. Stevens (A., T. & S. F.): There is no alternative possible.

The President: It means, of course, that there will be a signal section instead of a signal division. We will be a separate section.

Frank Rhea: It seems to me that this resolution was passed before you had time to consider it. It occurred to me that the status of railroad men, and possibly of the United States Railroad Administration, was in doubt. What is the status of railway men in Canada in this Signal Section? Do they have any status at the present time, other than affiliated railway members?

The Secretary: Answering Mr. Rhea direct, any employee of any railroad in the world, which railroad belongs to the A. R. A., we hope will be an appointed member by the railroad, which means that that individual, or as many individuals as are appointed by any one property, will be what are termed representative members.

Mr. Rhea: That is, for the United States Railway Administration?

The Secretary: For the universe, if you please.

Mr. Rhea: How will they be appointed for anybody that is not under the jurisdiction of the Railway Administration?

R. E. Trout
President of R. S. A.

The Secretary: Any one property which belongs to the A. R. A., which is international, becomes automatically, without the U. S. R. A. attached to it, a member of the Signal Division of the A. R. A.

Mr. Rhea: Are there other railroads that are members of the A. R. A.?

The Secretary: There are, including Canada and foreign countries.

Mr. Rhea: Under Order 70?

The Secretary: No, sir.

Mr. Rhea: I don't appreciate then how they can be.

The Secretary: Without hearing all the documents available, Mr. Rheat is speaking about the American Railway Association, and not the newly organized American Railroad Association. There is a difference in the technique of the two.

Mr. Rhea: Of course, I am not a mind reader.

The Secretary: I do not desire it understood that there is any secret code in the arrangement. The cards are all on the table, and if Mr. Rhea has not all the documents, we will be glad to produce them for him.

Mr. Rhea: This may be not pertinent to the situation, but there is another question I would like to ask now. This says that members are appointed by their respective railroads. Now, does that eliminate dues, and if you do not want the proceedings, can you still continue a member?

The Secretary: All members of the R. S. A. are now members of the Signal Division automatically, whether they are active, junior, associate, life or honorary members. A member in the circular spoken about is an appointee of an American railroad, a member of the A. R. A. from a certain specific railroad, which specific railroad has appointed one or more men from its railroad as members of the signal division, as signal experts. That is a detail that has not been developed, because a railroad might appoint a signal engineer, assistant signal engineer, inspector, supervisor, and assistant supervisor, and another railroad might only appoint a signal engineer. Those men are non-producing members in the signal division, for they do not pay dues, because the parent railroad who appointed them as representative members pays dues for them, so they are deadheads. That leaves on the active and junior list of the R. S. A. a certain number of employes who are not members or representative members, as we call them. Those people, if they desire, to continue in the Signal Division, are privileged to continue as affiliated members, because they are employed on railroads, international railroads, if you please, and they will pay $3, as they have in the past, for the privilege of membership, and receive the literature. The $3 is nominal, to reimburse our treasury for printing a lot of additional copies, which run into something like $4,000 beyond our regular quota.

The next affiliated member is a non-occupant of a position on a railroad; not necessarily a supply man, for instance, Mr. Rhea himself. He may be an affiliated member of the signal division by paying $6 per annum. This is after December 31, 1919, I am speaking about. All of these people that we have spoken of, whether they are R. S. A. tagged or signal division A. R. A. tagged, will come to our meeting, and they will be on the floor doing everything that they have done in the past, and they will do as they did in the R. S. A.

Mr. Rhea: Can there be such a thing as anyone joining as an affiliated member in the future?

The Secretary: We hope that there is not one man who is today a member who will drop out, and we hope that we shall be able to bring in at least 10,000 more.

Mr. Rhea: I have had a peculiar interest in this situation. I am No. 52 on the membership list. I have had a feeling in the past that I had somewhat of an equity in the R. S. A. That may have been visionary and optimistic. In the proceeding which has taken place I have somewhat of a feeling, as a non-railroad member, that there has been some equity removed from me. I feel that my property has been confiscated.

The Secretary: I hope Mr. Rhea will disabuse his mind of any such feeling, or anyone who has a similar feeling. Under the new conditions, when we adopt standards, we are in a position now to have them accepted by the higher authorities in the railroad business, which in the past has been a thing almost impossible of accomplishment. A careful analysis discloses not one

thing in which this change is not to the advantage of the association, and if there is anyone who sees any indication for the modification or for the breaking down, instead of building up, we will certainly welcome the expression of that opinion, in any way that it may come to us.

Mr. Stevens: As I analyze this thing, in the old R. S. A. we had certain types of membership who had certain privileges and then we had representative memberships. It is true, I think, on a letter ballot the representative vote could carry the standard. The members came to the meeting just as they will do now, and presented matters for letter ballot on the floor, and if we did not agree to them we did not approve them, and we will be able to carry out the same action now. In the old days, if the membership thought well enough of the standard to submit it to letter ballot, the representative vote carried it, just as the membership, appointed by the railroads now, will carry it, if it is to be carried, or dispose of it otherwise.

As I view the situation, we will have no direct connection with the Railroad Administration, but the Railroad Administration will have sufficient confidence in what the Executive Committee of the A. R. A. does, if they are requested so to do, to make certain appliances standards of the railroads in the country, and that is the only function that the Railroad Administration intends to use in connection with our activities. We will go along recommending standards just as we have done. The members who were voting on the floor will still have the vote, and the only difference will be when a letter ballot is put out, those members will not have a vote, and that is practically what they have not been doing since we established the representative vote.

The Secretary: The railroads will appoint the representative member, and all other members are active members as they were in the R. S. A.—that is their status.

W. H. Arkenburgh (Can. Nat. Car. Co.): Under the old plan, representatives of manufacturers have been privileged to come to the meetings and pay our dues, but not vote on anything except the place of meeting. Under the new arrangement do we have the rights of members?

The Secretary: You have the right of voting on the floor—you have all the privileges of active membership.

P. M. Gault (I. C.): You have not said anything about company members. There are still a certain number of the members in the association who are employed by companies, and I would like to know what their status is.

The Secretary: Companies are corporations and corporations are members of the American Railroad Association, the same as in the case of the U. S. R. R. A.

J. C. Mock (M. C.): I want to ask whether all the formalities in the change of name have been properly gone through with? Ordinarily a change of name, a change of organization, including a change of dues, responsibilities, etc., would be a matter for the membership to decide rather than the board of direction.

The President: The board of direction did meet, and they called in as many members of the Association as they could get together. I believe Mr. Mock was invited but did not come. We tried to get as many members together as we could to pass on this subject.

Mr. Gault: Who is going to have the representative, the railroad administration or the owner? You cannot have both.

The Secretary: My understanding is that all corporate organizations which choose to be, are members of the A. R. A. All of the Administration railroads that desire to become members of the A. R. A. are members. Now, there cannot be any conflict.

W. H. Elliott (N. Y. C.): I will state in answer to Mr. Gault's question that the corporation membership in the A. R. A., and that the reprecentative appointed to cast the vote of the railroad on the basis of one vote for each 1,000 miles, will be appointed by the railroad subject to the control of the Railroad Administration.

Mr. Stevens: I feel somewhat the same as Mr. Mock with regard to the action of the R. S. A. joining the A. R. A. You have heard the circular read today putting the matter before you, and it has been approved. I think, however, so far as the R. S. A. is concerned, the matter would be in better standing if the same circular was approved by the annual meeting and finally approved at the annual convention. I do not believe that the board of direction should have done anything so radical on its own initiative. The submission of this circular to the eastern meeting and the annual convention will bring out more good points than bad ones. It will be a good thing to do.

Mr. Rhea: I have studied the constitution and cannot find that the board has the authority for this action. Mr. Camp and Mr. Stevens also know that the active membership of the association had no voice in what has happened. I am of the opinion that this matter should have been submitted to the whole association for a vote before any action was taken.

Mr. Stevens: I want to take issue with that statement. The R. S. A. has not been confiscated by the A. R. A. They have not made any effort to do that. They formed a new association, the American Railroad Association, and they asked the R. S. A. to join, and the board has taken the best action it could so far as details are concerned. What I would like to see done is to have approval of the membership in our proceedings. I move that the R. S. A. circular presented at this meeting, dated February 24, be presented both at the Atlantic City meeting and the annual convention, for the approval of the members of the Railway Signal Association.

C. A. Dunham (G. N.): I feel called upon to disagree with what Mr. Rhea has said. As a member of the Board I fail to find where any alternative proposition was available. It may be, under the old R. S. A. constitution, that the Board has perhaps gone a little far in making the amalgamation or transfer, if you please, of this association as the Signal division of the A. R. A. But I feel this meeting is not disposed to criticize the board for doing the only thing that it could do.

Under the new organization, every member of the old association has acquired a membership in a much larger and stronger association than was true before. As a member of the Signal division of the A. R. A. he is going to have a great deal better status than was true under the old conditions. The findings of this Signal division, if you please, are going to have the force of executive adoption and approval, and the recommendations of the Signal division, when so approved, will be obligatory, not optional. We are going to be in a very much stronger position in the future than has been true in the past. I feel very sure that the Signal division is going to receive very cordial support from the A. R. A. and in a short time we will find ourselves very much better situated than has ever been true in the past.

A. G. Shaver (Consulting Engineer): I have been a member of the R. S. A. a number of years, and it has always been the practice, so far as I have been aware, when there has been in contemplation change of any kind, to let it be known to the membership of the association and the matter acted on as the constitution provides. I have not understood that the change now made at the whim, in a measure of a few railroad officers in this

country, has been submitted to the membership as the constitution provides. It is my understanding that the R. S. A. is an incorporated body, working under a constitution, and if that is so, the constitution provides the method of procedure, and unless such procedure has been followed, the R. S. A. still exists.

I have been interested in the proceedings of the R. S. A. for many years, and I dislike exceedingly that any change in its name or activities should be brought about. Primarily you are now providing something to accomplish what a few people in the country want, and it may be only temporary. You probably will have to make a change again later on. I am bringing this matter up, in the hope that some means may be found whereby an affiliation of the R. S. A. with the A. R. A., in some way, will accomplish what the Railroad Administration would like without taking too radical a step towards a consolidation with the A. R. A.

Mr. Dunham: Mr. Shaver struck a responsive chord in the hearts of a good many members. It is unquestionably true, as a matter of personal privilege, we would like to have retained many features of our old association. But that is not the question—under the situation the R. S. A. had no alternative. You will remember in 1917, through the American Railway Engineering Association the A. R. A. laid the foundation stone, if you please, of an amalgamation of all of the voluntary associations and we thought that ultimately we would be consolidated into the A. R. A.

As President of the association at that time it was my privilege to present the situation for the R. S. A. to the governing board of the A. R. E. A., and that association in turn transmitted the reports from all of the voluntary associations to the A. R. A. I make this statement rather with the idea we should be prepared to feel that we are not going back to the previous conditions. I believe I am violating no confidence when I state that the railroad executives of this country have felt for a long time that the activities of the various voluntary associations, while desirable in many respects, were not well co-ordinated, and that it was desirable to draw them into a closer and better working organization.

Mr. Rhea: Mr. Dunham made some of the points I had in mind. This has been a voluntary association and we had a constitution and an equity in the association. Under compulsory action the change was made, apparently the members had no vote in the matter—the board of direction, to save the situation, as he apparently puts it, has taken action which they thought was necessary, but it has not been done in conformity with the constitution of the R. S. A.

One of the reasons we have in America the great transportation machine which we have all been proud of is that we have had our voluntary associations and have had the benefit of the individual initiative of the members of those associations, and God help us if we lose that in whatever form it may come up.

A. G. Shaver: I agree with what Mr. Rhea has had to say. I still think the R. S. A. should be continued. I can see we are forced into a scheme of some kind to get the affiliation that certain individuals want, but the affiliation might come, it seems to me, in some manner that will still leave the R. S. A. as it has been in the past, with the membership having the right and privilege to express its will which it cannot do under the arrangement now proposed. The membership of the R. S. A. as part of the A. R. A. is going to kill the individual initiative as I see it.

W. M. Camp (Railway Review): The board is pleading that it did this thing under pressure and had no alternative. I do not know whether that is true or not. The same proposition was put up to the A. R. E. A. and they took a vote of the membership on it, and the membership voted it would *not* go into the proposed amalgamation on the terms submitted. The American Railroad Association has submitted new terms and the expectation is now that the A. R. E. A. will come in. But I want to call your attention to the fact that the A. R. E. A. *did* take a vote and turned it down. This association, apparently, did not have the grit to do it.

Mr. Dunham: I think the action taken by the meeting this morning ratifies the action already taken by the board. There was a difference between R. S. A. and the A. R. E. A. The latter association was purely voluntary and was composed wholly of members who paid their own dues, with a few exceptions. There was no railroad membership in that association. Now, that was not distinctly true of the R. S. A. The railroad companies, through their representative membership in the R. S. A. had authority to adopt any standard or other proposition submitted to them, and that may be, in a sense at least, a direct representation of the railroads, as it was in fact, because the railroads paid for the representative voting power according to their mileage. It seems to me that that difference brought the R. S. A. well within the scope of the A. R. A.

The board does not lack courage in any sense of the word. There is not a signal engineer on the railroads who has not had a difficult time of it for the last 20 years, largely because he has not had proper backing, either through the railroads or through an association. I submit that that weakness has been removed by this change of organization. We are now going to be affiliated with a strong railroad organization that is going to give us a backing, and we will find that our recommendations will receive more careful attention and be given greater recognition. We are not going to be hanging to a shoe string as in the past.

W. J. Eck (Southern): I would like to assure the members that they have not been tricked. The board of direction has not put anything over anybody and it has not been a matter of lack of courage or anything of that sort. It has proceeded in an orderly manner. About a year ago the subject of the amalgamation of the various associations was discussed by the board for a long time and a report was presented and approved by the association by a viva voce vote, that should occasion come, where a universal railroad association should be established, the R. S. A. would become a part of it.

It is possible there are others who are in the same position as Mr. Mock, who said he did not realize what was going on, but as a matter of fact, it was open and above board, and when it came about that the Director-General of Railroads asked that the American Railroad Association be formed, the board of direction of the R. S. A. not only had the constitution to back them, but they also had the approval of the association to enter into such an arrangement. In case the arrangement should terminate the securities of the old R. S. A. are held intact by the board of direction and all the machinery is preserved so that the R. S. A. could be resurrected tomorrow if it was necessary.

F. W. Pfleging (U. P.): I object to any insinuation that the board of direction had the big stick held over them. In fact, the board put up the proposition, and outlined the work, and submitted it to the A. R. A. for adoption. I know that the committee of direction put up everything and no one told them to do it.

Mr. Fugina: I was notified of the original conference the board of direction had with reference to this mat-

ter about a year ago. Since that time until recently I was violently opposed to the action the board contemplated. There were other signal engineers who felt the same way. We discussed the matter at various times among ourselves and were much inclined to criticize the action of the board of direction. When a number of the members were told by the board of direction exactly the arrangement that was to be effected, they won over every one of us, and I believe the R. S. A. will fare better in the future than in the past. I do not believe that the board of direction has had any lack of courage, after they told me what they had done I felt they had a great deal of courage, and I believe the members of the association can thank them for it.

As to other points, I do not believe it is imperative for this association to take action—I believe that the board of direction had power to handle the matter—and I believe if the members will go into the matter fairly, they will be convinced that it is really a great thing for the advancement of the association. At the same time, I believe that the members of the association should have an opportunity of ratifying the plan; we should give them the privilege to vote on it.

The Secretary: Section IV of the constitution reads as follows:

"The board of direction shall manage the affairs of the association and shall have full power to control and regulate all matters not otherwise provided for under the constitution, except to make the association liable for debt to an amount greater than that which, at the time of contracting the same, shall be in the secretary-treasurer's hands, in cash, and not subject to prior liability."

It is a fact that there is nothing in the constitution to provide for such a transfer.

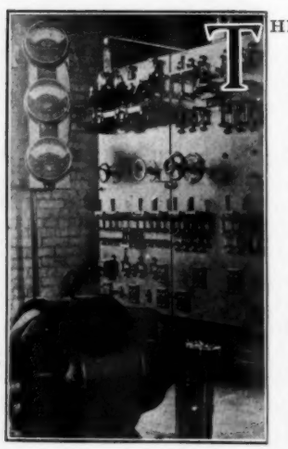
H. M. Sperry: If we review a few facts we may clear our minds on this subject. (1) The railroads are in the possession and control of the federal administration; (2) the R. S. A. was a railroad organization, as shown by its representative members, and, therefore, differs from the ordinary voluntary organization; (3) the change was a necessary change as a part of the railroad program, that is, the Administration program; (4) the action has been ratified by your board of direction and the plan put through and it was actually ratified at this meeting, and, therefore, in any action taken now you must upset your previous ratifications.

As to the position the directors were placed in in deciding this, they had a very difficult proposition. They were faced with precedent, and no one likes to go against precedent, but they had the courage to do what they had to do and did it well, and as we stand today the R. S. A. is not changed and put on the shelf, but it has changed its name and is a bigger and stronger association, and the proof is the attendance at this meeting. (Applause.)

Mr. Stevens: I want to support everything that has been said with reference to the approval of the board's action. I do not think we will ever go back, even voluntarily, to our old status. I have always been an advocate of co-ordination of the voluntary associations in this country, because we are connected together in a way, and the standards of one association will overlap with those of the others, and we cannot do the work we should do unless we have some co-ordination. I wish to withdraw my motion.

On motion by Mr. Elliot, discussion was concluded.

Report of Committee III—Power Interlocking



THE COMMITTEE SUBMITTED a report on the following subjects: Specification for Electric Motor Switch Operating and Locking Mechanism, Specification for Electric Interlocking Machine. Only such sections of the specifications as have not been presented before are printed below. Regarding section 1-g. Tests made by various members of the committee and checked by other interested members of the association indicate the proposed specification will ordinarily provide a factor of safety of two, at the present maximum switch loading. Other structures along railroads which must withstand shocks without failure ordinarily have factors of safety from three to six. The views of the members were desired on this point.

Section 2-e provides for R. S. A. lock and operating rods, which as yet are not standardized. Section 2-l also provides for an R. S. A. switch layout as regards centering of lock and operating rods.

Section 2-h with reference to unauthorized movement. The committee desires criticism on this point.

The adoption by the association of this specification will automatically change the following sections of the Electric Interlocking specifications now in the Manual. 300. Switch mechanisms.

(a) Switch operating and locking mechanism shall conform to R. S. A. specification for Electric Motor Switch Operating and Locking Mechanism.

(b) Switch motor shall conform to R. S. A. specification for Electric Switch Motor.

Sections 301 and 312 will be eliminated.

The committee recommended that the specification for electric motor switch operating and locking mechanism and that the one for electric interlocking machine be accepted for presentation to the annual meeting for approval and submission to letter ballot for inclusion in the Manual.

Specification for Electric Motor, Switch Operating and Locking Mechanism

First and Second Range Voltage

1. Operating Requirements

(a) Mechanism shall perform its normal operation in the following sequence: (1) Throw detector bar one-half stroke, and unlock switch. (2) Throw switch. (3) Lock switch and throw detector bar one-half stroke. (4) Indicate. 1919.

(b) Mechanism shall be so constructed and equipped with an efficient friction clutch that it can be stopped, reversed, or obstructed at any point of its movement without damage. 1919.

(c) Mechanism shall be so constructed that it will follow the movement of the controller at the point of control. 1919.

(d) Mechanism shall be so constructed that indication cannot take place nor locking device complete its movement, unless the lock rod has moved to the full normal or full reverse position and the position of the mechanism corresponds thereto. 1919.

(e) Circuit controlling device shall be so constructed that

it will, for proper operation, be dependent upon the movement of the lock rod. 1919.

(f) Normal operating voltage for: (1) First range voltage mechanism shall be 20 volts, and time of operation at this rating shall not exceed 30 sec., nor shall it exceed 40 sec. at a voltage 20 per cent below normal. 1919.

(2) Second range voltage mechanism shall be 110 volts and time of operation at this rating shall not exceed four seconds, nor shall it exceed five seconds at a voltage 10 per cent below normal. 1917.

(g) Mechanism shall normally be capable of delivering to either the operating rod or detector bar connection, an operating effort of not less than 4000 lb. at any point of the stroke. 1919.

2. General Design

(a) Mechanism shall be equipped with a terminal board constructed from moulded insulating material (approved by the purchaser) on which all wiring in the case, including motor wires, shall terminate. Such terminal board shall be readily accessible and be housed in a weather-proof compartment within the mechanism case and provided with a separate metallic cover. Each terminal thereon shall be marked by stencilled imprint or other equivalent method. The wiring, neatly arranged, shall be placed in fiber ducts or chases of ample capacity and shall form an integral part of the apparatus. R. S. A. rubber-insulated wire not less than No. 14 A. W. G. provided with eyelets, at each end, shall be used. 1919.

(b) Circuit controlling device shall be housed in a non-sweating, dirt-proof compartment within the mechanism case and be provided with a separate metallic cover. Four contacts shall be provided in addition to those necessary for the control of the mechanism, so designed that they will be positive in action and each can be adjusted to open or close at any part of the operation as required. Contact terminals shall be marked by stencilled imprint to correspond to the marking on the mechanism terminal board. 1919.

(c) Contact springs shall be made of non-corrosive material of sufficient mechanical strength and current carrying capacity to satisfactorily operate in connection with the circuits used. 1919.

(d) Switch box in accordance with R. S. A. specification { shall / shall not } be provided. Such switch box shall be housed in the compartment with circuit controlling device. The contact terminals shall be marked by stencilled imprint to correspond to the marking on the mechanism of the terminal board. 1919.

(e) Mechanism and case shall be designated for use with lock rod, R. S. A. drawing....., and operating rod, R. S. A. drawing..... Ends of plungers or locking dogs and holes or notches in lock rod shall have square edges. Such holes or notches shall not be more than 1/16-in. larger than the plunger, measured on a line parallel to the travel of the lock rod. 1919.

(f) Mechanism, circuit controlling devices and terminal board shall be enclosed in a substantial metallic weather-proof case, designed for two tie supports, the cover of which shall be equipped with suitable fastenings for application of purchaser's padlock, and when opened, shall provide access to all parts. Means for readily draining oil and water accumulations shall be provided. 1919.

(g) Mechanism case shall be provided with wire opening for all wires entering case and equipped with couplings, adapter casting and armored hose connection, R. S. A. 1410. 1919.

(h) Mechanism shall be designed to prevent an unauthorized movement due to (a) unauthorized derangements; (b) external force applied to connections; (c) mechanical vibration. 1919.

(i) Mechanism shall be designed to permit an emergency operation by use of a hand crank which shall be furnished when specified as a part of such mechanism. 1919.

(j) Provision shall be made outside the mechanism case to hold hand crank and secure same against theft. The opening through which the crank is to be applied for hand operation shall be provided with a metallic weather-proof cover attached to the mechanism case, and equipped with suitable fastenings for application of purchaser's standard padlock. The location of such cover shall be conspicuously marked. 1919.

(k) Mechanism and case shall be so designed that they will be applicable to right or left-hand switch operation and can be readily changed from one to the other in the field. 1919.

(l) Mechanism and case shall be so designed that the centering of the lock and operating rods and the location and kind of fastenings to switch ties will conform to switch layout, R. S. A. drawing..... Mechanism operating rod shall have six-inch throw. 1919.

(m) Mechanism and case shall be designed for operation of detector bar R. S. A. 1098, and mechanism shall provide nine-inch total stroke for driving such bar. 1919.

(n) Mechanism case shall be designed so all unused openings may readily be securely closed. 1919.

(o) Mechanism case and motor assembled as applied to a switch, the ties of which have been adapted not more than two inches, shall not extend more than two inches above top of rail (A. R. A. clearance diagram). 1919.

3. Dielectric Tests

(b) Surface leakage space of not less than ¼-in. shall be provided between any exposed metallic part of the apparatus carrying current and any other metallic part thereof. 1919.

(c) Windings shall withstand a potential test of twice their rating at a suitable frequency without an excess current indicating a short circuit. 1919.

6. Bearings

(a) Bearings shall be of ample dimensions to insure reasonable durability. 1919.

(b) Means shall be provided for necessary lubrication of bearing surfaces. 1919.

(c) All exposed oil holes shall be provided with weather-proof oil cups or covers. 1919.

8. Paint

(a) Mechanism and case, except finished parts, shall be painted one coat of red lead and raw linseed oil and two finishing coats of purchaser's standard paint. 1919.

(b) Finished parts shall be coated with manufacturer's recommended rust preventive. 1919.

9. Tests

(d) Switch mechanisms shall be subject to, and withstand without injury, the following tests:

1. Insulation test at place of manufacture of 3000 volts a. c. applied to the assembled electric apparatus for one minute. The potential shall be obtained from an a. c. generator or transformer of at least five k. w. capacity. 1919.
   (a) Windings to ground. 1919.
   (b) Between windings. 1919.
   (c) Between any terminal post, or circuit controller and ground. 1919.
   (d) Wiring to ground. 1919.
2. The application of sufficient power to motor connection of gear train so that a push or pull of 5000 lb. will be delivered throughout the stroke of the throw rod during normal time of operation. 1919.
3. The application of sufficient power to gear train so that a push or pull of 5000 lb. will be delivered throughout the stroke of the detector bar driving connection during normal time of operation. 1919.

Specification for Power Interlocking Machine

3. Drawings

(a) Purchaser's drawings. Drawings shall accompany the specifications and form an essential part thereof. 1919.

4. Design

(a) The machine frame and locking bed shall be composed of sections, each containing not more than 15 lever spaces, and shall be so designed that additional sections may be added on either end. 1919.

(b) Like parts of the machine shall be interchangeable. 1919.

5. Locking

(b) Locking required for insuring the proper sequence in the operation of working levers shall be installed with the machine. 1919.

(c) For each spare lever and each spare space, provisions shall be made in the locking bed to accommodate either:

1. One locking shaft with one cross locking bar and one longitudinal locking bar for the full length of the machine. 1919.
2. One tappet with one longitudinal locking bar for the full length of the machine. 1919.

(d) The machine shall be equipped complete with locking guides or brackets. 1919.

(e) Locking shall be distributed as uniformly as possible in the locking bed and so arranged as to be easily accessible. 1919.

6. Levers

(a) Levers shall be numbered from left to right, and be in accordance with requisite sheet. 1919.

(b) Levers shall be arranged so that they can be removed without interfering with the operation of other levers. 1919.

(c) Spare levers shall be furnished in place complete with magnets, standard circuit controllers, locking shaft and driver, or tappet, and connections and tappet complete for the operation and control of their respective units. 1919.

(d) All levers shall be equipped with reverse latches. 1919.

(e) All levers, except those of the horizontal slide type, shall be equipped with normal latches. 1919.

(f) Levers shall be designed to permit the application of electric locks independent of indication locks. 1919.

7. Case

Machine shall be enclosed in a case, which shall have separate removable doors or panels for each section to give access to all parts of the machine, and shall be provided with locks as provided for on requisition sheet. 1919.

8. Painting

Painting of the machine and case shall be in accordance with R. S. A. specification. 1919.

9. Dielectric Tests

(c) Separate windings, which are insulated from each other, shall withstand a potential test of 3000 volts a. c. for one minute between their terminals and other metal parts from which the windings are insulated. 1919.

(d) A potential of twice the normal operating requirement at a suitable frequency shall be impressed across the windings without any excessive flow of current indicating a short circuit. 1919.

11. Circuit Controllers

Machine shall be equipped with manufacturer's standard circuit controllers necessary for the control of the circuits shown on drawings listed on requisite sheet. 1919.

12. Indication.

(a) Levers for the control of switches, derails, movable frogs, crossing bars, drawbridge locks and bolt locks shall be equipped with devices to insure the locking of the units in a position corresponding to the position of the levers before the release of the mechanical locking can be effected. 1919.

(b) Levers for the control of signals shall be equipped with devices to prevent hte release of the mechanical locking until the signals directly or indirectly controlled have assumed their normal position. 1919.

(c) Switch levers shall be free to move between their indicating positions. 1919.

13. Terminal Board

Machine shall be provided with a terminal board, constructed from insulating material, approved by the purchaser, and provided with terminal or binding posts for making all connections to the machine. 1919.

14. Lever Light Indicators

(a) Lever light indicators, when required, shall be located in front of the machine immediately above or below the levers. 1919.

(b) Electric lamps for lever indicators shall be in accordance with R. S. A. specification. 1919.

15. Contacts

(a) Contact springs shall be made of non-corrosive metal, or shall be protected against corrosion, and of sufficient strength and current carrying capacity to satisfactorily operate in connection with the arrangement of interlocking units for which the machine is furnished. 1919.

(b) Contact springs shall make sliding contact. 1919.

22. Requisites

(c) Machine shall be designed to operate in accordance with track and location plan....., dated..... 1919.

(d) Machine shall be as shown on contractor's general drawing....., dated....., or catalogue reference..... 1919.

(e) Upon the completion of the work called for by this specification the following contractor's { tracings / blueprints / Van Dyke prints } shall become the property of the purchaser:

1. Track and location plan. 1919.
2. Locking sheet. 1919.
3. Dog chart. 1919.
4. Combination wiring. 1919.
5. Manipulation chart. 1919.
6. Track diagram. 1919.
7. Cable and wiring plans. 1919.

(f) Levers:

Lever frame;
Working levers, Signal .....
Switch .....
.....
.....
Spare levers, Signal.....
Switch .....
.....
.....
Spare spaces .....
Total .....
1919.

(g) Machine shall be designed for the control of circuits, the maximum voltage of which will be.....volts { direct / ..... cycle, alternating } current, and where special requirements are to be met, ... amperes. 1919.

(h) Electric locks together with normally open latch circuit controllers in addition to the indication locks (magnets) shall be provided for { section locking. / approach locking. / check locking. / .....locking. 1919.

(i) Electric lock magnets shall be arranged for normal operation at.....volts { direct / .....cycle, alternating } current. 1919.

(j) Lever indicators shall of the { electric light / ..... } type for normal operation at ..... volts { direct / .....cycle, alternating } current. 1919.

(l) Levers controlling signals { shall / shall not } be provided with lever indicators. 1919.

(m) Auxiliary circuit controllers of the { spring / mechanical stick } type shall be provided for the following levers..... and shall have.....contacts. 1919.

(n) Automatic time release providing.....seconds retardation in lever movement shall be provided for the following levers..... 1919.

(o) Insulation of coils and windings, if not enameled wire or fabric covered wire, impregnated, shall be as follows..... ..... 1919.

(p) Case:

Case shall be of { steel, enamel / wood. ..... / ..... } finish and equipped with { purchaser's standard cabinet / ..... } locks.

1919.

Committee: F. B. Wiegand (N. Y. C.), chairman; I. S. Raymer (P. & L. E.), vice-chairman; F. W. Pfleging (U. P.), vice-chairman.

Sub-Committee "A."—F. W. Pfleging, chairman; F. J. Ackerman (K. C. T.), Daniel Cushing, A. B. DuBray (I. C. C.), N. S. Lynch (M. P.), J. W MacCormack (K C. T.), O. R. Unger (M. P.), J. B. Weigel (L. & N.), G. A. Ziehlke (U. P.).

Sub-Committee "B."—B. J. Schwendt (T. & O. C.), chairman; E. T. Ambach (B. & O.), S. J. Dewey (C. C. C. & St. L.), H. L. Kilian (N. Y. C.), J. H. Oppelt (N. Y. C. & St. L.), H. H. Orr (C. & E. I.), J. C. Seaman (N. Y. C.), T. C. Seifert (C. B. & Q.), W. C. Sibila (N. Y. C.).

Sub-Commitee "C."—I. S. Raymer, chairman; G. H. Burnette (Monongahela), W. D. Carrol (B. & O.), G. A. Motry.

Sub-Committee "D."—Jacques Stoltz (N. Y. C.), chairman; L. E. Carpenter (P. R. R.), C. G. McCauley (W. T. Co.), Charles Soper (L. I.), Walter Tyler (L. I.), G. C. Whitney (N. Y. Mun. Ry.),

Discussion

F. B. Wiegand (Chairman), presented the preliminary part of the report and B. J. Schwendt (T. & O. C.) presented the portion of the report regarding the specification under operating requirements.

W. K. Howe (G. R. S.): While all signal companies are using friction clutch, in my opinion that paragraph would be fully complete if the words "with an efficient friction clutch" were omitted. It is conceivable that something other than a friction clutch might be used to equal or possibly better advantage. I would like to have inserted the words "or other suitable means" after the words "friction clutch."

Mr. Wiegand: The committee will accept that addition of the words "or other equivalent means."

Mr. Schwendt presented Sections (c), (d), (e) and (f-1) of the report regarding operating requirements.

W. H. Reichard (F. S.): It seems to me that it is necessary to add to paragraph F-1 the circumstances under which these times and voltages should apply, and I would suggest that there be appended "when connected to reasonably free working switch," and the size specified.

T. S. Stevens (A. T. & S. F.): I notice that in 1-G there is a maximum operating effort provided. Why not make this time dependent on the operating effort, being not greater than as provided for in 1-G.

Mr. Schwendt: That is what the committee had in mind, and the point brought out by Mr. Reichard was talked over. It would be pretty hard to say what would be a reasonably free working switch, and to specify the conditions, so we tried to confine it to the maximum operating effort.

Mr. Stevens: Why not tie them both together in some way by including in f-1 that fact, a voltage 20 per cent below normal when the operating effort is not greater than in 1-g, or some sentence of that kind?

Mr. Schwendt: The committee accepts the suggestion.

(Mr. Schwendt then submitted the portion of the report as to second range voltage mechanism.)

Mr. Reichard: I understand the paragraph about to be read now under g is going to be tied with the first and second range voltage times. Is that so?

Mr. Schwendt: We are simply going to tie them with an operating effort not exceeding that specified in 1-g.

Mr. Reichard: I think that the committee is of the opinion that the switch machine should develop then an operating effort of four thousand pounds through a stroke of six inches, as we will ultimately develop, in four seconds of time; is that so?

Mr. Schwendt: Shall be capable of doing that as a strength requirement.

Mr. Reichard: I think the horse power output of that effort is far beyond the present practice of any switch mechanism with which I am acquainted. It seems to me that is a very impracticable designation.

Mr. Schwendt: It is not brought out in this specification. The committee has not considered as part of the assignment the design of the motor, and made no specification regarding the motor. This leaves the switch machine then standing by itself, as far as strength requirement is concerned, and attempts to establish a factor of safety. It does not necessarily follow that the motor would have to be of equal strength if it is not required. If it is required, the same switch machine will really do.

Mr. Reichard: It would seem to me if there is no motor connected in this specification, the design of operation and the voltages expressed are inconsistent with the specifications.

Mr. Schwendt: The two necessarily have to be tied together on account of strength requirements, and that was the thought of the committee in putting in such things that would indicate the motor was included.

L. F. Howard (U. S. & S.): Do I understand this is merely a specification to insure the stresses of the switching movement without the stresses imposed by the motor? That being the case, I suggest (g) be eliminated entirely, because I think (b), under Section 1, will impost all the stresses that are necessary to insure that you have a sufficiently strong mechanism. I am positive in switching mechanisms that the track-resisting phases of the mechanism are of great importance, and it is well known that impact tests are required for wheels that are subjected to shock as well as tests of tensile strength, and it does not seem to me that the report you read is any criterion on which to build a general specification for switch makers.

Mr. Schwendt: The committee before attempting to establish these figures made a number of tests to ascertain about what the different machines were doing—it did not attempt to break any machines, but in making those investigations we found a number of cases where 2,150 lb. were actually required on throw rod. We thought a factor of safety of two would not be too great, and we suggested the 4,000 lb. minimum.

At this point the discussion became lively as to the items in the specification covering the strength of the apparatus and various points were brought out by the members on the floor, and the manufacturers took issue with certain paragraphs presented on this subject. The type of insulation used was also discussed and suggestions made for the rewording of such paragraphs.

(Mr. Schwendt then read Par. (b), under general design, and several members offered criticisms that were submitted to the committee.)

Mr. Reichard (Fed. Sig. Co.): As to General Design 2 (d), I think that is another reason for the requisite sheet. "Switch-box in accordance with R. S. A. Specification." How can anyone tell to-day what that is going to be? A switch-box, I believe, should properly be termed a switch circuit controller. It is in committee at the present time. We may be able to conveniently house such a mechanism in the switch machine house. If this paragraph is left in, then every switch machine which is built in accordance with these specifications will have to have sufficient room in which the switch-box may be used. It would seem to me, perhaps, that more definite information should be given concerning the switch circuit controller.

Mr. Schwendt: It was the thought of the committee in placing that as it has in 2 (d) to make provision for the switch box in the mechanism case, so that it all can be self-contained. By making this provision, all the wires will go into just one point.

Mr. Stokes: I would say that in the switch circuit controller the R. S. A. specification would answer whether it was operated from the point or to the point and the lock. It seems that it has not left anything to the imagination as to whether this space is to be provided in the housing of the switch machine, or as to whether or not it shall be installed when the machine is ordered.

Mr. L. H. Howard: As to 2 (g), I would suggest the elimination of R. S. A. 1410. There are many cases where that connection would not be suitable.

Mr. Schwendt: The committee had in mind hose couplings in fixing it so it would be an easy matter to connect up to a movement from any angle in order to meet that condition and make it more universal.

Mr. Reichard: With regard to 2 (m) I would suggest the elimination of all reading matter after R. S. A. 1098, without the additional information that the mechanism shall provide nine inches total stroke.

C. F. Stoltz (C. C. C. & St. L.): 1 (a) provides that the movement under the sequence in which the mechanism performs shall operate the detector bar one-half inch stroke. If the detector bar is to operate but one-half inch stroke, why should the mechanism move nine inches?

Mr. Reichard: I don't think it is necessary to be specific with regard to nine inches.

Mr. Schwendt: The committee will take that.

Mr. Reichard: I could not comment on 3 (b) unless I am advised whether the motor is to be considered as part of this specification.

Mr. Schwendt: I assume eventually the motor will be considered as part of this specification, and I think remarks should be made on the assumption that it will.

Mr. Reichard: Then I think we should have the exception of ¼ in. with respect to motor commutators.

Mr. Schwendt: Any objection to 8 (a)?

W. K. Howe: These machines are painted with this red lead and linseed oil, and it takes three or four days for them to dry. It is very expensive, and do you think it is necessary that all of the parts that you have mentioned be painted with red lead?

Mr. Schwindt: What would you suggest on that, as to the inside?

W. K. Howe: There are many mechanisms that are now being coated with linseed oil only, and cast iron parts seem to stand up pretty well when so treated. The thing that I have in mind is to get rid of that red lead and linseed oil that takes so long to dry.

Mr. Schwendt: The Signal division of the A. R. A. now has the A. R. A. specifications for painting, and I would like to ask Mr. Howe if it would be satisfactory if we include a clause reading that the painting of the mechanism shall be in accordance with the R. S. A. specification for shop painting?

Mr. Howe: I don't believe I know what that is.

Mr. Saunders: At the time that R. S. A. specification was under discussion, the question of dipping castings was discussed, and I believe it was agreed that that was the preferred method, of dipping them in paint, not red lead. Specification 8 (a) as it now reads covers too much to be covered in one clause. I think you will have to split it up to cover various parts, and in all probability apply the R. S. A. specification for painting a majority of them.

(Mr. Weigand read R. S. A. Specification 1198.)

Mr. Howard: Doesn't that refer principally to wrought iron and steel? A great many of these mechanisms are cast iron, which is one of the most rust-resisting materials there is. Personally, I believe a dipping coat is absolutely as much as you ought to put on cast iron.

Mr. Schwendt: The committee will consider the suggestion made.

(Mr. Wiegand submitted specifications for power interlocking machine and after receiving suggestions from several members, the committee was excused with thanks.)

Report of Committee II—Mechanical Interlocking

THE COMMITTEE presented a report on unit specifications for mechanical interlocking machines having S. & F. locking, and recommended that they be accepted for presentation to the annual meeting for approval and submission to letterballot for inclusion in the Manual. The specifications follow:

1. General

(a) Machine shall be arranged for (vertical horizontal) leadout. 1919.

(b) Machine shall have..... levers and ..... spare spaces, total..... 1919.

(c) Levers shall be numbered and arranged in accordance with a track and signal plan, dog and locking sheet approved by the purchaser. 1919.

(d) Levers ..... shall be equipped with counterweight of ..... pounds, to assist in moving them to normal position. 1919.

(e) Machine legs, bottom girders, lever shoes, lever number plates, quadrants, top plates, rocking links, back, front and intermediate rails, and blocks, bearings and locking brackets shall be made of cast iron. 1919.

(f) Latch shoes, latch handles, latch nuts, universal links, link blocks, drivers for end of locking shafts, locking shaft drivers for longitudinal locking bars, bottom girder caps, swing locking dogs and driving pieces for longitudinal locking bars shall be made of malleable iron. 1919.

(g) Levers, tail levers, latch rods, end strips and locking bracket caps shall be made of open hearth steel. 1919.

(h) Locking shafts, longitudinal locking bars, cross-locking, locking dogs and stops, driving piece blocks and all pins shall be made of cold drawn steel. 1919.

(i) Latch springs shall be made of spring steel wire. 1919.

(j) Trunnions shall be made of forged steel. 1919.

(k) Machine shall consist of four and eight lever sections. 1919.

(l) Levers shall be spaced five inch centers. 1919.

(m) Height of machine for vertical leadout shall be 2 ft. 8½ in. from bottom of leg to top of finished top plate. 1919.

(n) Height of machine for horizontal leadout shall be 3 ft. 5⅞ in. from bottom of leg to top of finished plate. 1919.

(o) Like parts of machine shall be interchangeable. 1914.

(p) Each spare space shall be equipped with lever shoe, pin and cap. 1919.

(q) Bolts and screws shall have U. S. standard threads. 1919.

(r) Nuts, bolt and cap screws shall be hexagonal unless otherwise specified. 1919.

(s) Bolts and cap screws shall be provided with spring lock washers where practicable. 1919.

(t) Taper dowel pins shall be standard taper one-fourth inch per foot. 1919.

(u) When necessary to hold parts in fixed relation to each other, dowel pins or finished bolts shall be used. 1919.

(v) Moving parts of machine shall work freely without lost motion. 1919.

(w) Machine painting shall be in accordance with R. S. A. specifications for painting. 1919.

2. Machine Legs

(a) Legs for vertical lead-out machine shall be 2 ft. 7¼ in. in height and base of leg shall be provided with four holes for ¾-in. bolts. 1919.

(b) Legs for horizontal lead-out machines shall be 3 ft. 5 in. in height and base of leg shall be provided with four holes for ¾-in. bolts. 1919.

3. Bottom Girders

(a) Bottom girders shall be fastened to legs with two ¾-in. thin square head finished bolts. 1919.

(b) Caps shall be fastened to bottom girders with two ½-in. square head bolts. 1919.

4. Top Plates

(a) Top plates shall be fastened to machine legs with six ½-in. T head bolts, one ½-in. cap screw and four 7-16-in. taper dowel pins. 1919.

(b) End strips shall be fastened to top plates with two ½-in. T head bolts. 1919.

5. Levers

(a) Levers shall be numbered left to right. 1916.

(b) Levers shall be 5 ft. 10⅛ in. from center of fulcrum to end of handle. 1911.

(c) Levers shall have equal and uniform throw. 1919.

(d) Tail levers shall be drilled to provide 8¾-in., 9¾-in.,

10¾-in. stroke and shall be interchangeable as front or back tail levers. 1919.

(e) Lever shoes for vertical lead-out machine shall provide approximately equal stroke above and below horizontal and so arranged that connections can be made to front or back tail levers. 1919.

(f) Two-position levers shall be latched in normal and reverse positions. 1914.

(g) Three-position levers shall be latched in normal, central and reverse positions. 1914.

(h) Levers and tail levers shall fit sungly into lever shoes and be fastened thereto with two ¾-in. finished bolts. 1919.

(i) Lever shoe pins shall be 1-in. diameter. 1919.

(j) Latch shoes shall provide for 4½-in. opening for latch springs and shall be fastened to levers with two ½-in. tap bolts and one 7-16-taper dowel pin. The hole for dowel pin to be located below the hole for the lower tap bolt. 1919.

(k) Quadrants shall be fastened to top plates with three ½-in. bolts. 1919.

(l) Rocker links shall be fastened to quadrants with one 1-in. diameter pin, pin to be held in place in quadrant with one ⅜-in. headless set screw. 1919.

(m) Latch rods shall be straight ⅝ in. by 24¾ in. from end of block to end of thread, thread to be S.A.E. standard 2¼ in. long and supplied with hexagon check nuts. 1919.

(n) Latch nuts shall be designed with ⅝-in. offset, to be 3 in. long from center of hole to end of nut and to be tapped with S.A.E. standard ⅝-in. tap. 1919.

(o) Latch springs shall be 11-16 in. inside diameter and shall be of proper strength to operate the locking bars when the lever is at either end of quadrant and the latch is free to drop. 1919.

(p) Latch handles shall be 12 in. long from center of holes to end of handle and shall be connected to lever and latch rod with two ½-in. cheese head pins. 1919.

(q) Lever number plates shall be fastened to levers with one ½-in. cheese head pin. 1919.

(r) Universal links shall be 5¾ in. center to center, and connected to rocker links with one 1-in. flat swivel pin and one ½-in. cheese head pin. 1919.

(s) Link blocks shall be 1 in. by 1½ in. by 1⅛ in. with a sliding fit, and to have 5-16 in. by 5-16 in. lip. 1919.

6. Locking

(a) Machine shall be provided with mechanical locking of a type which will be effective prior to the application of energy to the unit controlled. 1919.

(b) Machine shall be fully equipped with cross-locking brackets and locking shafts with cranks and drivers. For each spare lever and each spare space, one cross-locking bar, and one longitudinal locking bar for the full length of the machine shall be provided with operating connections complete. 1919.

(c) Locking shall be distributed as uniformly as possible without crowding in the locking bed and so arranged as to be easily accessible. 1919.

(d) Bearings for front, back and intermediate rails shall be fastened to machine legs with four ½-in. bolts and two 7-16-in. taper dowel pins. 1919

(e) Bearings for machines having locking beds wider than 24 way shall be provided with supports under outer end. 1919.

(f) Front and back rails shall be interchangeable. 1919.

(g) Intermediate rails shall be wide enough to accommodate two standard locking brackets. 1919.

(h) Front, back and intermediate rails shall be provided with one way caps. 1911.

(i) End blocks shall be fastened to rails with one ⅜-in. cap screw. 1919.

(j) Ends of locking shafts shall be square and of like dimensions. 1914.

(k) Drivers for end of locking shafts shall be fastened to locking shafts with one ½-in. bolt and connected to universal link with one ½-in. cheese head pin. 1919.

(l) Drivers for longitudinal locking bars shall be of the clamp type with filler blocks and fastened to locking shafts with one ⅝-in. bolt and nut through end of driver. 1919.

(m) Eight and 12 way locking brackets only shall be used. 1919.

(n) Locking brackets shall be planed out for longitudinal bars to a depth of 1 37-64 in. below finished top of bracket and shall be 1 1-16 in. wide and for cross-locking bars to a depth of 25-32 in. by 49-64 in. wide. One ¼-in. and two 7-16-in. holes shall be drilled with jig through end of bracket and shall be fastened to rails with four ⅜-in. cap screws and two ¼-in. straight dowel pins. 1919.

(o) Longitudinal locking bars shall have 1¾-in. stroke and shall be provided with stops for normal and reverse positions of the bar. 1919.

(p) Splices in longitudinal locking bars shall be made by means of two channel clamp splices and fastened together with two ¼-in. bolts with nuts and cotters. 1919.

(q) Trunnions for swing dogs shall be reversible and shall be provided with washers and cotters. 1919.

(r) Swing dogs shall be straight and reversible. 1919.

(s) Straight locking dogs, Nos. 2 and 5 only, shall be used, and shall be drilled so that a normal drive dog can be made a reverse dog by turning it end for end, or a reverse dog can be made a normal dog in the same manner, or a double end dog, No. 5, can be made to take the place of either a normal or reverse dog. 1919.

(t) Locking drivers, dogs, swing dog trunnions and stops shall be riveted to longitudinal bars with ¼-in. rivets. 1919.

(u) Latches when locked shall have not more than 1-16-in. lift for direct locking between levers and an additional lift of not more than 1-64 in. for each special in the combination. 1919.

7. Material and Workmanship

(a) Material and workmanship shall be first class in every respect. (G. P. 9-a.) 1911.

(b) The contractor shall replace, at his own cost, any part or parts of the apparatus and material furnished by him, which shall, within a period of one year from date of acceptance of the installation, fail to perform its proper function because of any defect in the design, construction, application or erection of such apparatus. (G. P. 9-b.) 1915.

8. Inspection

(a) Purchaser will make such inspection of the completed product as to assure him that the requirements of the specification have been met. (S. S. I.-a.) 1917.

(b) Purchaser may make desired inspection at all stages of manufacture. (S. S. I.-b.) 1917.

(c) The manufacturer shall make such tests as may be necessary to demonstrate to the satisfaction of the purchaser that the apparatus is in accordance with the requirements of the specifications and contract. 1918.

9. Packing

(a) Material shall be packed to permit convenient handling and to prevent loss or damage during shipment. (S. S. P.) 1916.

10. Marking

(a) Purchaser's order and requisition number, name of consignor and name and address of consignee, shall be plainly marked on outside of package. (S. S. M.-a.) 1916.

(b) Detail list of loose pieces, containers and their contents shall be furnished for each shipment. Where carload shipments are made, show routing and car identification. (S. S. M.-b.) 1916.

Committee: C. J. Kelloway (A. C. L.), chairman; G. W. Chappell (N. Y., N. H. & H.), vice-chairman; Samuel Miskelly (C., R. I. & P.), vice-chairman; Larsen Brown (A., T. & S. F.), O. H. Eichblatt (S. P., Atlantic System), F. E. Jacobs (C. & W. I.), J. W. McClelland (P. & R.), W. B. Morrison (D., L. & W.), E. J. Relph (N. P.), R. W. Taylor (B. & O.), Wm. Dawson (N. Y. C.), Oswald Frantzen (N. Y., N. H. & H.), H. F. Lomas (I. C.), E. E. Mack (C. & E. I.), E. K. Post (P. R. R.), Chas. Stephens (C. & O.), J. I. Vernon (N. Y., N. H. & H.), W. F. Zane (C., B. & Q.).

Discussion

E. J. Relph (N. P.): In connection with (d) this is for vertical, how about horizontal?

Mr. Kelloway (Chairman): One could be provided if a weight is found necessary. There are only a few cases where counter weights are necessary, and the committee has provided for those few cases.

Mr. Relph: In (f) I propose they be made of cold drawn steel, the same to be held in place with a cotter pin.

Mr. Kelloway: That is a good point, and the committee will take that into consideration.

P. M. Gault (I. C.): In regard to the latch spring

that Mr. Relph mentioned, the specification is indefinite, and when you turn to levers, the size of the wire used for the spring is not mentioned. I think the spring should be so designed that we would get the same spring from each manufacturer and they would be interchangeable.

C. A. Dunham (G. N.): I ask the committee if it has given consideration to the question of increased lever ratios. If I am not mistaken, paragraph (n) contemplates practically the present-day machine, with a lever-ratio of about 1 to 5, I believe it is. It has been my experience that an increased lever-ratio would be a good thing. I believe some of the members would be interested in knowing that the practice abroad provides for a ratio of 2 to 7, giving the tower man more power and making a mechanical machine which works easier than the standard machine here.

Mr. Kelloway: That has been considered. Some of the companies manufacture such a machine today, and they are being used on the Pennsylvania Railroad and the Atlantic Coast Line, but we decided four years ago to go back to the standard machine, believing that the increased length of lever was not advantageous.

Caleb Drake (C. & N. W.): I think there should be something provided to take care of the end pin on each end of the machine from working out. I have looked at the detailed specification and cannot find it.

J. A. Peabody (C. & N. W.): We have had these pins come out. There should unquestionably be some provision made for taking care of them. It can be done by means of tap screws or otherwise.

Mr. Kelloway: The committee will consider that matter.

Mr. Gault: Nut locks should be added to that clasp, as we frequently have these come loose.

G. H. Dryden (B. & O.): I would suggest in (c) "levers shall have equal and uniform throw" the addition of, "and shall be in true alinement."

Mr. Kelloway: The committee will accept that.

Mr. Relph: Is the committee figuring on designing a new lever shoe for the horizontal step. The present lever shoe does not fit in the lever and is held in place by three bolts and a dowel pin. According to (h) a new lever shoe would have to be designed.

Mr. Kelloway: The committee did not deem it necessary to provide a new lever shoe for new horizontal machines, as you lead your pipe connections off from the horizontal, and therefore the old lever shoe was considered a proper design.

A. J. Kelly (C. C. C. & St. L.): We have had occasion to change our latch shoes and the dowel hole did not run up, and we should specify just how much below that is to come.

Mr. Kelloway: We will consider that point.

Mr. Gault: The specification by inches does not give an exact specification to dowel pins. That is something with which many of the section men have had trouble. They measure one end and the fellow who slips them out measures the other end, and if they were ordered by number, we would get what we wanted.

Mr. Kelloway: We simply state how the latch shoe is to be latched to the lever. We refer to dowel pins later on, and give specifications for them. The committee has spent considerable time on the matter of latch springs. Perhaps Mr. Howard will give us a statement on this subject.

L. F. Howard (U. S. & S. Co.): I said that the specification, as it appeared at the time of the annual meeting, was not sufficient. That is, if you want to draw up a specification of a spring you should specify the general dimensions, and specify the compression to be given by different voltages and get something you want. In order to do that, you will have to first make experiments to find out what load you want to handle, and knowing the load, you can specify the compression. You can then determine the dimension of the latch shoe. We agree the way it is specified now will take care of the situation by putting in fillers where you want to get increased tension for the machines.

W. H. Elliott (N. Y. C.): I think the latter part of this specification should be revised along the lines stated by Mr. Howard, and between now and the time it is put to letter ballot, to make a positive requirement instead of leaving it to general investigation. We have made tests to determine what we believe is a proper load for a spring for the levers.

Mr. Kelloway: The committee will be glad to consider that matter.

Section (b) expresses the consensus of opinion at the New York meeting. Mr. Christofferson suggested, and it was approved by the association that we would have all locking brackets in the machine, and cross-locking bars, drivers and shafts for the spare levers and spare spaces, and we got it out in that way.

C. A. Christofferson (N. P.): I do not think there will be much trouble in fitting up a lock on our own machine. It might be that we might have to make a few changes, but it is much better to have a bar in and provide for it, than to have a lot of short bars in that you might have to take out.

Mr. Howard: I would suggest that in par. (m) that the words "not more" be inserted, so that it will read, "and not more than 12."

Mr. Kelloway: The committee will be glad to go into this matter.

Mr. Kelloway: The committee has given the matter of straight swing dogs (par. (r)) further consideration, and is prepared to recommend the present type of dog, except that it shall be 3/8 in. thick, and each dog shall be interchangeable.

Mr. Gault: Referring to paragraph (s), at the meeting in New York last fall, I believe Mr. Kelloway stated the number of dogs had been reduced to five or six.

Mr. Kelloway: The committee will re-write this paragraph and include additional dogs that we have found it is necessary to have, in respect to some of the larger machines.

Mr. Ralph: I don't think the size of the machine should determine what dog should be done away with. I see no reason why we should not use 1, 2, 3, 4, 5, 6, 7, 9, 11, and 13, doing away with 10, 12 and 8.

Mr. Kelloway: We can lock up all machines with the number of dogs that we have recommended. It may require a little additional labor in making up dog charts.

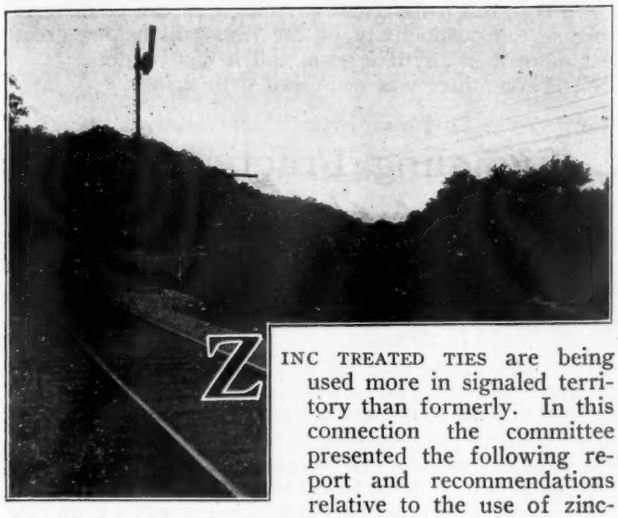
Mr. Stevens: I suggest the elimination of par. 7, and the addition of the warranty clause as provided in the power specification.

Mr. Kelloway: We accept that.

Mr. Relph: Mr. Chairman, I have a clause: "All parts of machines that can be knocked down shall be marked with steel figures, and given the numbers which they take in the assembling machine. Locking brackets, cross-locking, longitudinal locking and swing dogs shall be marked to read from the back of the machine. Longitudinal bars shall have their letter numbers marked directly over their drivers. Swing dogs shall be marked with letter numbers at the trunnion end, and space bars at the nose end.

(The committee was dismissed with thanks.)

Report of Committee IV—D. C. Automatic Block Signaling



ZINC TREATED TIES are being used more in signaled territory than formerly. In this connection the committee presented the following report and recommendations relative to the use of zinc-treated ties in track circuits.

1. As the electrical conductivity of zinc-treated ties decreases with age during the first year, better results may be had by allowing the ties to season for a period of from two to six months before using in a circuited track, thus avoiding the use of the tie while its conductivity is greatest.

2. For good results, the number of zinc-treated ties installed per year in any track circuit should not be greater than 15 per cent of the total number of ties in that circuit.

3. (a) It is recommended that a maximum rail resistance not to exceed .1 ohm per 1,000 ft. of track be maintained. Ordinarily it will be lower. This resistance can and should be reduced to a minimum by using bonding wires of high conductivity or increasing the number of bonding wires per joint.

(b) Rail and bonding resistance may be determined by the following formulæ in which

E—Volts at rail—battery end.
e—Volts at rail—relay end.
I—Amperes flow from battery.
i—Amperes flow through relay.
R—Rail and bonding resistance total in ohms.
r—Rail and bonding resistance per 1,000 ft. of track in ohms.
L—Length of track circuit in feet.

$$R = \frac{2\,(E\text{-}e)}{(I+i)} \qquad r = \frac{2000\,(E\text{-}e)}{L\,(I+i)}$$

4. (a) The length of track circuit should be determined by the ballast resistance or the resistance from rail to rail through ties, ballast, and track insulation.

(b) The following table expresses in ohms per 1,000 ft. of track readings on various kinds of ties:

Ballast Resistance in Ohms per 1,000 Ft. of Track

Date, 1917	Section 1	Section 2	Section 3	Section 4	Section 5	Section 6	Temperature	Humidity
April 12	4.27	5.36	48.02	44.55	24.87	13.37	40° F.	40%
May 17	2.28	3.22	34.52	24.68	21.19	12.42	82° F.	73%
June 8	1.91	2.76	15.66	15.72	9.50	5.82	58° F.	50%
Aug. 6	3.48	6.42	32.82	26.99	12.65	16.05	78° F.	46%
Sept. 14	2.56	3.15	14.64	14.27	9.67	6.55	77° F.	56%
Oct. 25	4.85	6.06	28.92	28.92	15.96	7.77	41° F.	75%
Average	3.23	4.49	29.09	25.85	15.64	10.33		

Key: Section 1—Zinc-treated red oak.
Section 2—Zinc-treated red oak soaked and scrubbed.
Section 3—Red oak treated with 25 per cent creosote, 75 per cent gas oil.
Section 4—Red oak treated with 10 per cent creosote, 90 per cent gas oil.
Section 5—White oak untreated.
Section 6—Various species—old ties in place for several years.

(c) Ballast resistance may be determined by the following formulæ in which

E—Volts at rail—battery end.
e—Volts at rail—relay end.
I—Amperes flow from battery.
i—Amperes flow through relay.
Y—Ballast resistance total in ohms.
y—Ballast resistance per 1,000 ft. of track.

$$Y = \frac{2\,(E+e)}{(I\text{-}i)} \qquad y = \frac{2000\,(E+e)}{L\,(I\text{-}i)}$$

(d) Unless the ammeter with which the current readings are taken is of an extremely low resistance, such readings should be taken only for the purpose of determining the resistance of the unit and relay. The current flow should then be calculated from these resistances and the voltage drop across them, otherwise the error due to the resistance of the instrument will affect the results.

(e) When the rail resistance is equal to .1 ohm per 1,000 ft. of track, a 2-ohm relay used, and the ballast resistance per 1,000 ft. of track as determined by the above formulæ is as shown below, the track circuits should not exceed the lengths shown opposite the following resistances:

1 ohm —2,200 ft. 3 ohms—4,400 ft.
2 ohms—3,400 ft. 4 ohms—5,200 ft.

The lengths as above shown provide for the operation of the relay at 150 deg. F., under which condition, with .6 volts at the battery, 115 milamperes flows through the relay.

5. Because of a low ballast resistance in track circuits where zinc-treated ties are used, a 2-ohm relay should be used, as it will operate satisfactorily when a relay of higher resistance will not.

Committee: C. F. Stoltz (C. C. C. & St. L.), chairman; G. H. Dryden (B. & O.), vice-chairman; F. H. Bagley (L. & N.), M. A. Baird (Erie), E. E. Bradley (W. M.), J. H. Butridge (I. C.), T. N. Charles (Southern), J. J. Corcoran (N. Y. C.), A. R. Fugina (L. & N.), R. E. Green (M. C.), E. Hanson (G. C. & S. F.), Leroy Wyant (C. R. I. & P.), G. W. Hulsizer (C. & A.), Geo. A. Kirley (B. & A.), G. W. Kydd (B. & O.), B. A. Lundy (N. Y. C.), E. B. Pry (Penn. Lines West), G. W. Trout (P. M.), E. L. Watson (P. R. R.), E. P. Weatherby (T. & P.), E. E. Worthing (S. P. Lines Atlantic System), R. B. Arnold (C. & N. W.).

Discussion

A. R. Fugina (L. & N.): There are a number of things in the report that I believe should have further consideration. I refer more particularly to Par. 1, in which it is stated that the period of seasoning ties should be from two to six months. I don't believe that two months is sufficient time for seasoning. I believe that the minimum should be six months. Par. 2, it seems to me, should be further qualified; that is to say, 15 per cent of the total number of ties in a circuit may be renewed each year. That depends a great deal upon the length of the track circuit, and it depends upon the track circuit conditions. With certain track circuits, under good track circuit conditions, you may be able to use more than 15 per cent, and on other track circuits it would not be practical to use as much as 15 per cent. In other words, the rail resistance and the ballast resistance of the track circuit will determine the number of zinc-treated ties that can be used in the circuit.

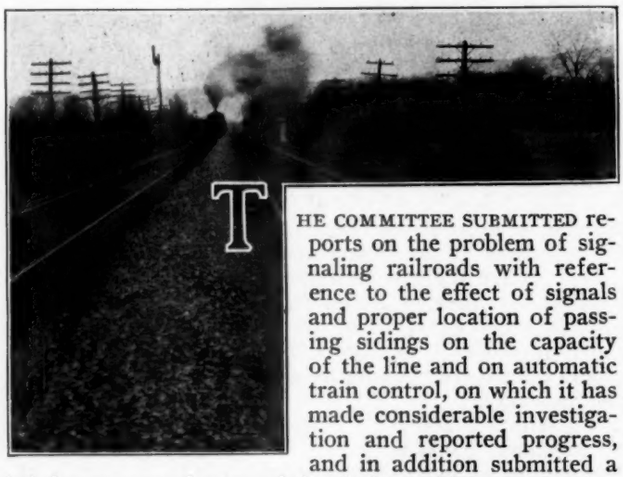
Under 4-e, I don't think that 115 milamperes is sufficient. In other words, that we would require at least 130 milamperes flowing through the relay. For that reason it may be that the information given is somewhat misleading.

We will now call for the report of Mr. C. F. Stoltz, Chairman.

Mr. Stoltz (Chairman): The committee's idea was that it should not require that all ties should wait for six months before being installed. It depends altogether on how much zinc is put into the ties, and that is something that railroads will have to settle for themselves. There is another thing I want to lay emphasis on, and that is bonding resistance. The success, or rather the failure of the track work, is more often due to bad rail bonding that it is to bad ballast, and anything that can be done to increase the conductivity of the rails will help a great deal more than anything else, and it can be done.

(The committee was dismissed with thanks.)

Report of Committee X—Signaling Practice



THE COMMITTEE SUBMITTED reports on the problem of signaling railroads with reference to the effect of signals and proper location of passing sidings on the capacity of the line and on automatic train control, on which it has made considerable investigation and reported progress, and in addition submitted a brief summary of some of the devices which are showing promises of development. These devices are: The American Train Control System; Shadle Automatic Train Control; National Safety Appliance Company, and Shweyer Automatic Train Control.

The committee recommended that the matter on location of sidings and that on automatic train control be accepted and presented to the association as information.

Effect of Siding on Capacity of Two or More Tracks

In the study of the effect of signaling (block signaling) and the location of passing sidings on the capacity of a track with traffic in one direction, we have quite a different problem from that of a track with traffic in both directions, for while in both cases time is the governing feature in determining how many trains can be operated between two points, in the case of a track with traffic in both directions it is the time of opposing trains which controls; whereas on a track with traffic in one direction it is the time of following trains. The subject naturally divides itself into two parts: First, a proper location of passing tracks; second, capacity of a line without passing tracks.

Proper Location of Passing Tracks

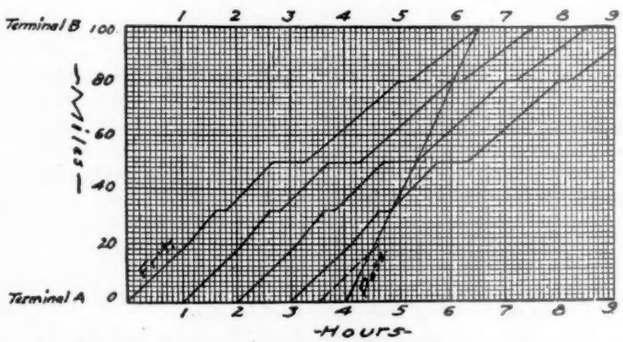
In order that we may have a concrete example on which to base the formulæ and methods which we intend to produce, we will take a 100-mile division on which only two classes of trains are operated. First, freight trains whose running time over the division, including necessary stops for coal and water, is 6½ hr.; and second, passenger trains whose running time over the division is 2½ hr. The running time of the freight train we will assume to be as follows:

From terminal A to mile post 20	66 min.
From mile post 20 to mile post 32	30 min.
From mile post 32 to mile post 50	54 min.
From mile post 50 to mile post 80	105 min.
From mile post 80 to terminal B	78 min.
Total	333 min.

The necessary stops for the freight train we will assume to be 12 min. at mile post 32 for water; 33 min. at mile post 50 for coal and water, and 12 min. at mile post 80 for water; total time for stops being 57 min., so that the total time consumed on the division, as before assumed, would be 390 min.

The accompanying diagram shows a freight train leaving terminal A at 12 midnight and arriving at terminal B at 6:30 a. m., and a passenger train leaving terminal A at 4 a. m., arriving at terminal B at 6:30 a. m. It is quite evident from an inspection of this diagram that if there were no passing tracks on the division, no freight trains could be operated between midnight and 4 a. m. In other words, the passenger train occupies the line for four hours. This time of four hours is equal to the difference between the running time of the freight train and the running time of the passenger train; or if we let T represent this interval of time, and tF and tP represent the total running time of the freight and passenger trains, respectively, we would have $T = tF - tP$.

If there were no passing tracks on the division, but one freight train could be operated during this interval



Graphic Method of Locating Passing Tracks on Double Track Lines

of time. If there was one passing track on the division of only one train capacity, then only one more freight train could be operated, and if there were two such passing tracks, then only two more freight trains could be operated. So, the number of trains that could be operated during this interval of time would be one more than the number of passing tracks. It is also quite evident that the maximum delay which could occur to a freight train at terminal A if there were no passing tracks would be four hours, for if it could not leave terminal A in time to reach terminal B before the passenger train, it would have to wait at terminal A until after the passenger train had left that terminal. Consequently, the maximum delay would also be equal to $tF - tP$. It is quite evident that the proper location of passing tracks would be one that would cause the minimum amount of delay to the freight trains when they are passed by the passenger train. In order to show the conditions under which such

a minimum delay will occur, we present the following diagram (Fig 2):

This diagram is a portion of the usual train diagram, and it shows two freight trains being passed by a passenger train at adjacent sidings. Freight train No. 1 arrives at siding B at such a time in advance of the passenger train that it can clear the main line in accordance with any rules that may be in effect relative to this particular train movement. Freight train No. 2 also arrives at siding A the same amount of time in advance of the passenger train. These would be the conditions under which the minimum amount of delay would be caused to the freight trains, and that delay would be only the actual time which it is necessary for a freight train to lose due to its entering a siding to be passed by another train. This loss of time, which we will call *a*, may be divided into three parts, as follows: (1) The time lost by the freight train due to stopping for switch and starting again and getting into clear on the siding, which time we will call *b*; (2) the time the freight train must remain at rest on the siding in order to be passed by another train, which time we will call *e*; and (3) the time lost by the freight train in starting from the siding and re-

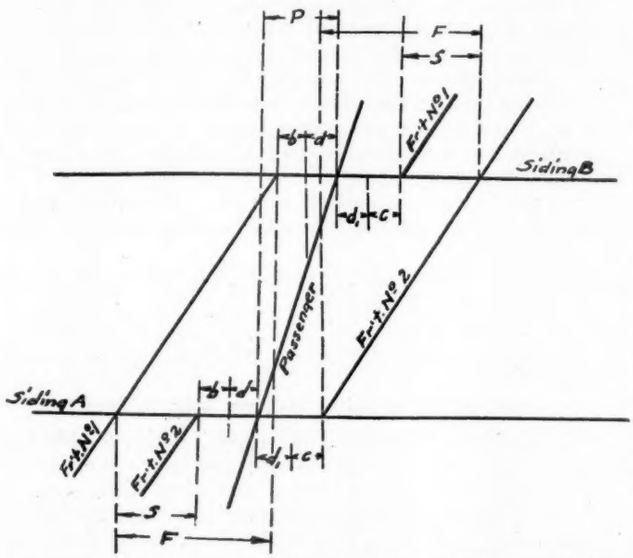


Figure 2. Location of Passing Tracks for Minimum Delay

gaining its normal speed, which time we will call *c*. The time *e* which a train must remain at rest on the siding is again divided into two parts. (1) The time which it must be into clear before the arrival of the passenger train as per rules which may be in force, and (2) the time which it must remain at rest after the passenger train has passed the siding. This time also being in accordance with rules which may be in force. These two subdivisions of the time *e* we will call *d* and d^1, respectively, so we would have $a = b + c + d + d^1$.

Representing the running time of the freight train between sidings by F, and the running time of the passenfer train between the same sidings by P, we would have from the diagram $S = F + c + d^1 - P - d^1 - c$. Or, $S = F + b + d - P - d - b$. Or, in either case, $S = F - P$. S in this case being the spacing in time between the two freight trains.

From this we learn that the minimum delay will occur to a freight train when the spacing between freight trains is equal to the difference in running time of the freight and passenger trains between the sidings. The maximum delay would occur to a freight train when, for example, freight No. 1 arrived at siding A just too late to make siding B in advance of the passenger train in accordance with the rules which may be in effect, and in consequence thereof it has to wait at siding A until the passenger train had passed that siding, in which case the freight train would arrive at siding B on the time shown on the diagram for train 2. The time lost by such a delay to freight No. 1 would be as shown by the diagram, equal to S, which, as heretofore shown, is F — P. The maximum delay is then the difference between the running times of the freight and passenger trains between the sidings and this maximum delay will be found on a division at the point where this F — P is the greatest.

Coming back now to the train diagram of our concrete example, it is quite evident that the maximum F — P will be the smallest when this F — P is the same for the space between each of the passing points; or, in other words, the passing tracks should be so located that the difference between the running time of a freight train and passenger train between them would all be equal, or, what is the same thing, the spacing between freight trains which are to be passed by the passenger train should be all equal.

As there is always one more space than there are passing tracks, we can construct the following formulæ:

$S = \frac{tF - tP}{N + 1}$, in which N equals the number of passing tracks. For example, if there were to be three passing tracks on the 100-mile division of our concrete example, the proper spacing between freight trains would be

$S = \frac{390 - 150}{4}$, or, $S = 60$ min.

The proper location of this number of sidings can be easily determined graphically by laying out on the diagram freight trains leaving terminal A one hour apart, or at 1 o'clock, 2 o'clock and 3 o'clock, and the points where they intersect the passenger train line would be the proper location of the passing tracks, or on the diagram at mile posts 32, 50 and 80. It will be noted from this diagram with such a location of passing tracks that the running time of a freight train between each of the passing tracks, plus the time that it is either taking water or coal, minus the running time of the passenger train between the same sidings, is in each case equal to 60 min. We can, therefore, establish the general rule that the proper location of passing tracks on a double track line would be such that the difference between the running time of the freight trains, including necessary stops, and the running time of the passenger trains, including necessary stops, between them should all be equal. This analysis does not take into consideration the use of the second main track for passing trains.

From the foregoing it follows that the capacity of a division is increased as the value of the time F — P is decreased. The value of this term may be decreased by either decreasing F, which would be increasing the speed of the freight trains, or by increasing P, which would be decreasing the speed of the passenger trains, and it is quite evident that the actual maximum capacity can only be reached when the value of this term is zero, in which case passing tracks would not be needed and the spacing of trains would usually be governed only by the longest time which the train is obliged to remain at rest at any point upon the division.

When all trains are running at equal speed the capacity of a division can be expressed by the simple equation,

$Z = \frac{f}{T}$, in which Z equals the number of trains, T an interval of time and *f* the interval of time between trains.

If no form of block signaling is employed, this time f is determined by the maximum length of time a train is obliged to stop at any point on the division for any purpose, such as for taking coal and water, in which event the time f is equal to the amount of time which the train remains at rest for such a purpose, and the equation for capacity under these conditions becomes $Z = \frac{T}{D}$, in which D equals the length of time consumed at the stop.

If the rules or a form of block signaling is used which requires a definite time interval between trains, then the capacity is determined by the simple equation $Z = \frac{f}{T}$, but in no case can f be less than D.

In neither of these cases is the speed of trains or their length a factor in determining the capacity of a division,

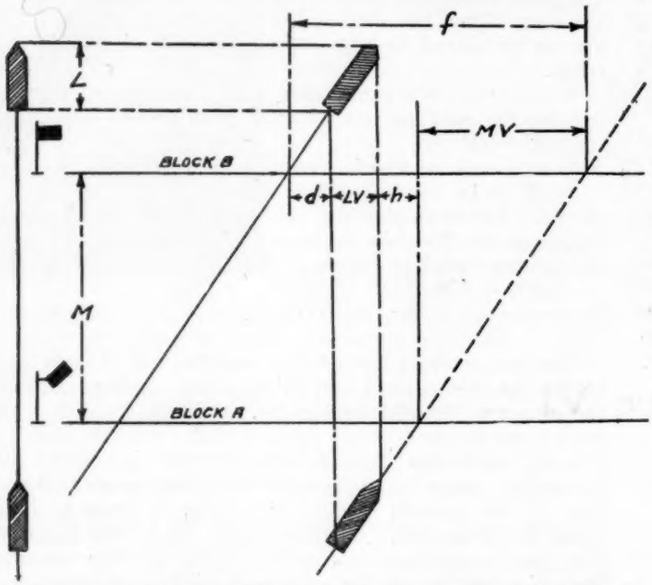


Figure 3. Diagram Showing Maximum Length of Block with Minimum Train Spacing

unless it should happen that D or f is less than the time it takes a train to travel its length. When, however, either rules, or a form of block signaling is used which requires a definite space between trains, then the term f depends not only upon the speed and length of trains, but also upon the length of time it requires the train to travel through the required space, and also upon two other factors which we will point out.

Capacity of a Line Without Passing Tracks

Figure 3 shows two trains running as close together as it is possible over a block signal territory. In this, figure M represents the maximum length of block in this territory and L represents the length of train. The time d is the time that must elapse after the rear end of the preceding train has passed block B before the signal at block A can be made to indicate "proceed." This time may be fixed by rule, in manual block operation or in automatic block operation it would be the time required for the signal at block A to assume a proceed position after the rear of a train had passed into the block governed by the signal B. The time h, which is commonly called "sighting time," is the time that must be allowed for the following train to observe the signal A after it has assumed the proceed position in order that the train A may continue at its normal speed. Representing the speed of the train in miles per minute by Lv, we would have for the value of f: $f = h + Mv + d + Lv$, and the equation for capacity would become $Z = \frac{T}{(M + L)\,v + h + d}$. If for any reason there is a necessary stop in any block, such as a stop for coal or water, then the time lost by a train on account of such a stop must be included in the time f, and if the time f for which the block in which the stop occurs is the maximum f for the division, then this stop becomes a factor in determining the capacity of the division. In this case we would have $f = h + Mv + d + Lv + D$. In this equation M is not the maximum length of block, but it is the length of the block in which the delay represented by D occurs. The equation for capacity now becomes $Z = \frac{T}{(M + L)\,v + h + d + D}$. To illustrate the use of these formulæ, let us determine the capacity of two pieces of road, over each of which only one class of trains is operated. One of these roads being equipped with manual and the other with automatic block signaling. Let it be assumed that the trains are ½ mi. long, and that they run at the rate of speed of 3 min. per mile on both roads. On the manual block road assume that the maximum length of block is 7 mi., and for the automatic block territory assume that the maximum spacing of signals is 1 mi., so that the maximum length of block for trains running under proceed signals would be 2 mi. In both cases let h equal ½ min., and in manual block let d be 5 min. and in automatic block ¼ min. We would have then as the capacity in trains per day: For manual block—

$$Z = \frac{1440}{(7 + .5)}\ 3 + .5 + 5 = 51.$$

For automatic block—

$$Z = \frac{1440}{(2 + .5)}\ 3 + .5 + .25 = 174.$$

Analysis of Line Having Mixed Traffic

A method of analyzing the capacity of a double track line where mixed traffic is operated is to consider the passenger schedule as fixed and then determine the amount of time these passenger trains occupy the line, the remaining time being that which is available for freight traffic.

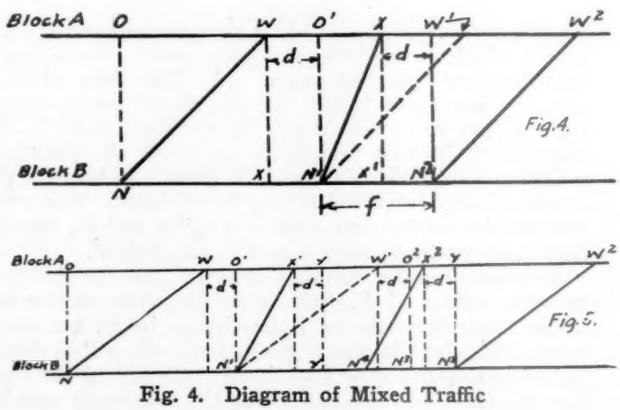


Fig. 4. Diagram of Mixed Traffic

In Fig. 4, N W represents a freight train, N^1 W^1 and N^2 W^2 representing other trains of equal speed. N^1 X^1 represents a passenger or other train running at a greater speed. It is obvious that f for the passenger train N^1 X^1 is all that the main track capacity is reduced

for freight purposes and that parallelogram N^1 W^1 W^2 N^2 will represent this reduction in capacity due to a single high speed train. In Fig. 5 as in Fig. 4, N W represents a freight train N^1 W^1 and N^2 W^2 representing other trains of equal speed. N^1 X^1 as in Fig. 4 represents a passenger train and N^4 X^2 represents a second one. From this it is obvious that when the time between two passenger trains N^1 N^2 is less than *f* for a freight train which in this case equals N^1 N^3, there is no time in which a freight train can enter the block; therefore, the total time that the main track capacity is reduced for freight purposes is passenger train time *f*, which equals N^4 N^2 plus the time between the passenger trains N^1 N4 or N^1 N^2 and the amount that the main track capacity is reduced for freight purposes, may be represented by the parallelogram N^1 W^1 W^2 N^2.

Application of Formulæ for Analyzing a Two or More Track Line

The report also included information concerning the application of formulæ on a double track line 122 mi. long having a heavy passenger business, with 36 regular passenger trains in each direction at the east end and 19 regular passenger trains in each direction at the west end. The line is equipped with automatic block signals.

The complete analysis includes a number of charts and explanatory matter concerning the present conditions and proposed changes, which included the addition of third and fourth tracks at certain points.

In order to obtain free use of the third and fourth tracks, 39 mi. of automatic signaling and 5 new interlocking plants besides the enlargement of some others would be required. The effect of the change would be a reduction of from 30 to 70 per cent in the interference resulting from the use of main tracks for freight service in various territories, and an increase in the number of freight trains that could be handled at the most restricted point from 21 to 29 trains, or 35 per cent. In addition, the time of trains over the road would be considerably reduced on account of the reduction in delays; the capacity of the yards at three points would be greatly increased and the lost time of locomotives at these points greatly decreased on account of greater freedom and better distribution of time when trains could be received and dispatched from these points.

Committee: J. A. Peabody (C. & N. W.), chairman; W. J. Eck (Southern), vice-chairman; C. C. Anthony (Santa Rosa, Cal.), H. S. Balliet (Grand Central Terminal), C. A. Christofferson (N. P.), C. E. Denney (N. Y. C. & St. L.), C. A. Dunham (G. N.), W. H. Elliott (N. Y. C.), G. E. Ellis (I. C. C.), J. V. Hanna (K. C. T.), J. G. M. Leisenring (Ill. Traction), H. K. Lowry (C. R. I. & P.), J. C. Mock (M. C.), F. P. Patenall (B. & O.), A. H. Rudd (P. R. R.), W. B. Scott (Gulf Coast Lines), T. S. Stevens (A. T. & S. F.), E. G. Stradling (C. I. & L.), B. Wheelwright (G. T.).

Discussion

(J. A. Peabody (chairman) presented the report.)

The report is made as information, and your committee recommends that this matter on the location of sidings be accepted by the association as information, and I so move. (Motion carried.)

The second subject, report on automatic train control. This is also submitted as information and I move that it be so accepted. (Motion carried.)

(The committee was excused with thanks.)

Report of Committee VI—Standard Designs

THE OUTLINE OF WORK assigned to the committee this year covers among other things the following:

(1) Prepare standard designs. (2) Prepare standard designs of switch fittings. (3) Check and criticize drawings which other committees are authorized to prepare, giving to each drawing a title and number. (4) Revise standard plans to meet unit specifications as approved.

The committee presented eight drawings, four of which are revisions of previous issues, two drawings are new, and two are presented for information and further discussion if found necessary:

R. S. A. 1014, One-Way Horizontal Pipe Compensator (Details and Assembly)—revised. Compensator base has been strengthened to avoid breakage in shipment and in service.

R. S. A. 1015, One-Inch Signal Pipe and Coupling (Details and Assembly)—revised. Rivet holes at one end transposed, to obtain more economical shop practice, and note "Slightly bevelled to remove burrs," added, after "ends faced."

R. S. A. 1070, Binding Post (Details and Assembly)—revised. Washer changed from No. 14 to No. 18 A. W. G. brass. Note changed from "Edges rounded" to "Sharp corners removed."

R. S. A. 1220, Cross-arm Bolts (Through and Double Arm)—revised. Square washer added, together with reference numbers.

R. S. A. 1409, Cotters (Size—Drilling—Location). Data Sheet—new.

R. S. A. 1459, Staff Tip Adapter—new.

Drawings S. K. 20, Movable Point Frog, and 21, Double Slip Switch, are submitted for reference and information, as confirming the discussion at the annual meeting in 1918, showing method recommended by Committee II as to disposition of rods and fittings.

The committee would like to have further discussion on the subject of "Fittings for Interlocked Switches," exhibits of which have been submitted to the association from time to time since 1914.

The committee was instructed by President Trout to follow up the matter of the standardization of lamps and in co-operation with the representatives of regional directors, meetings have been held with very satisfactory results, and it is thought that plans covering our recommendations will be presented at the next meeting.

Committee: F. P. Patenall (B. & O.), chairman; J. C. Mock (M. C.), vice-chairman; W. A. Hanert (N. Y. C.), C. J. Kelloway (A. C. L.), B. H. Mann (M. P.), F. W. Pfleging (U. P.), W. N. Spangler (P. R. R.), M. E. Smith (D. L. & W.), R. E. Trout (St. L.-S. F.).

Manufacturers' Representatives: J. J. Hubbard (F. S. Co.), W. P. Neubert (U. S. & S. Co.), H. B. Taylor (H. S. & S. Co.), S. N. Wight (G. R. S. Co.)

Discussion

In connection with the one way horizontal pipe compensator a few slight changes were suggested by some of the members. The same was true regarding the other designs submitted. The chairman of the committee was desirous of having the members discuss at length the fittings of interlocked switches as a guide in connection with future work on this subject.

Report of Committee XII—Contracts

THE COMMITTEE submitted as a progress report the following proposed form of contract for block signal and interlocking work:

THIS AGREEMENT, made this ..... day of ..... in the year ..... by and between ....., party of the first part, hereinafter called the "Contractor," and ..... party of the second part, hereinafter called the "Company":

WITNESSETH, That, in consideration of the covenants and agreements hereinafter mentioned, to be performed by the parties hereto, and of the payments hereinafter agreed to be made, it is mutually agreed as follows:

The contractor shall furnish all materials, superintendence, labor, equipment and transportation, except as hereinafter specified, and shall execute, construct and finish, in an expeditious, substantial and workmanlike manner, to the satisfaction and acceptance of the ..... of the Company, hereinafter called the "Engineer".....
.....
.....

The work covered by this contract shall be commenced within ..... days after the execution of this contract and shall be completed on or before the ..... day of ....., 19..

In the event of failure to complete the work within the time specified, there shall be deducted from the contract price the sum of ....., which amount is agreed upon not as a penalty, but as liquidated damages.

And in consideration of the completion of the work described herein, and the fulfillment of all stipulations of this agreement to the satisfaction and acceptance of the Engineer of the Company, the said Company shall pay, or cause to be paid, to said Contractor, the amount due to the Contractor, based on the following prices:
.....
.....
.....
.....

Bond

1. The Contractor agrees, at the time of the execution and delivery of this contract and before the taking effect of the same, to furnish and deliver to the Company a good and sufficient bond of indemnity to the amount of.....
.....dollars, as security for the faithful performance, by the Contractor, of all covenants and agreements on the part of the Contractor contained in this contract. The security in such bond of indemnity must be satisfactory and acceptable to the Company.

This bond shall remain in force and effect in such amount, not greater than that specified, as shall be determined by the Engineer.

Understanding of Plans and Specifications

2. The Contractor hereby distinctly and expressly declares and acknowledges that, before the signing of this contract, he has carefully read the same, and the whole thereof, together with and in connection with said plans and specifications, and that he has made such examination of this contract and of said plans and specifications, and the location where said work is to be done, and such investigation of the work required to be done, and in regard to the material required to be furnished, as to enable him to thoroughly understand the intention of the same, and the requirements, covenants, agreements, stipulations and restrictions contained in this contract and in said plans and specifications, and distinctly agrees that he will not hereafter make any claim or demand upon the Company, based upon or arising out of any alleged misunderstanding or misconception on his part of the said requirements, covenants, stipulations and restrictions.

Plans and Specifications.

3. The work to be done is more fully described in the specifications dated.....and the following plans:
.....
.....
.....
which specifications and plans are hereto attached and are hereby declared to be, and are accepted, as a part of this contract.

Work that may be called for in the specifications but not shown on the plans, or shown on the plans and not called for in the specifications, or anything not expressly set forth in either plans or specifications but which nevertheless is obviously necessary or implied, shall be furnished and performed the same as if specifically shown or mentioned in both.

Rights of Various Interests

4. Wherever work being done by Company forces or by other contractors is contiguous to work covered by this contract, the respective rights of the various interests involved shall be established by the Engineer, to secure the completion of the various portions of the work in general harmony.

Consent to Transfer

5. The Contractor shall not transfer this contract, nor sublet any part of the work without the written consent of the Engineer and such consent shall not relieve the Contractor of his liabilities under this contract.

Inspection

6. All work and material shall be at all times open to inspection, acceptance or rejection of the Engineer or his duly authorized representative. The Contractor shall provide reasonable and necessary facilities for such inspection.

Defective Work or Material

7. Any omissions or failure on the part of the Engineer to disapprove or reject any work or material shall not be construed to be an acceptance of any defective work or material. The Contractor shall remove, at his own expense, any work or material condemned by the Engineer, and shall rebuild and replace the same without extra charge, and in default thereof the same may be done by the Company at the Contractor's expense, or, in case the Engineer should not consider the defect of sufficient importance to require the Contractor to rebuild or replace any imperfect work or material, he shall have power, and is hereby authorized, to make an equitable deduction from the stipulated price.

Indemnity

8. The Contractor shall indemnify and save harmless the Company from and against all losses and all claims, demands, payments, suits, actions, recoveries and judgments of every nature and description brought or recovered against it, by reason of any act or omission of the said Contractor, his agents or employes, in the execution of the work or in consequence of any negligence or carelessness in guarding the same.

Settlement for Wages

9. Whenever, in the opinion of the Engineer, it may be necessary for the progress of the work to secure to any of the employes engaged on the work under this contract any wages which may then be due them, the Company is hereby authorized to pay said employes the amount due them or any lesser amount, and the amount so paid them, as shown by their receipts, shall be deducted from any moneys that may be or become payable to said Contractor.

Liens

10. If at any time there shall be evidence of any lien of claim for which the Company might become liable, and which

is chargeable to the Contractor, the Company shall have the right to retain out of any payment then due or thereafter to become due, an amount sufficient to completely indemnify the Company against such lien or claim, and if such lien or claim be valid, the Company may pay and discharge the same and deduct the amount so paid from any moneys which may be or become due and payable to the Contractor.

Risks

11. The work under this contract in every respect shall be at the risk of the Contractor until finished and accepted, except damage or injury caused directly by Company's agents or employes.

Order and Discipline

12. The Contractor shall at all times enforce strict discipline and good order among his employes, and any employe of the Contractor who shall appear to be incompetent, disorderly or intemperate, or in any other way disqualified for or unfaithful to the work entrusted to him, shall be discharged immediately on the request of the Engineer, and he shall not again be employed on the work without the Engineer's written consent.

Company's Employes

13. The Contractor shall not employ or hire any of the Company's employes without the permission of the Engineer.

Intoxicating Liquors.

14. The Contractor, in so far as his authority extends, shall not permit the sale, distribution or use of any intoxicating liquors upon or adjacent to the work, or allow any such to be brought upon, to or near the line of the railway of the Company.

Right of Company to Amplify Plans

15. The Company shall have the right, during the progress of the work, to amplify the plans, to add explanatory specifications and to furnish additional specifications and drawings.

Power of Engineer

16. The Engineer shall decide controversies arising between the parties hereto as to the meaning or intent of the plans and specifications. He shall give such instructions and directions as may be necessary for the Contractor to properly carry out the work, and his interpretation of the plans and specifications shall be final and binding. The Engineer shall have power to reject or condemn all work or material which is imperfect, defective or unworkmanlike, or which, in any way, does not conform to this contract; to direct the application of forces to any portion of the work, which in his judgment requires it; to order the force increased or diminished and to decide questions which may arise between the parties relative to the execution of the work.

Order of Completion. Use of Completed Portion

17. The Contractor shall complete any portion or portions of the work in such order of time as the Engineer may require. The Company shall have the right to take possession of and use any completed or partially completed portions of the work, notwithstanding the time for completing the entire work or such portions may not have expired; but such taking possession and use shall not be deemed an acceptance of the work so taken or used or any part thereof.

Changes

18. The Company shall have the right to make alterations in, additions to, or deductions from, the work, without in any manner affecting or making void this contract.

No changes, additions or deductions shall be made except upon written order of the Engineer and the value of the work so changed, added or deducted, shall be agreed upon and added to or deducted from the contract price.

Unavoidable Delays

19. If the Contractor shall be delayed in the performance of the work by reason of fire, flood, strikes or other causes beyond his control, or if the Company shall be delayed in the performance of its covenants and agreements by causes beyond its control, then the time for completion of the work may be extended, as may be agreed upon, without in any way affecting the conditions of this contract or the liability of sureties on the bond.

Suspension of Work

20. The Company may at any time stop the work, or any part thereof, by giving.....days notice to the Contractor in writing. The work shall be resumed by the Contractor in.....days after the date fixed in the written notice from the Company to the Contractor so to do. The Company shall not be held liable for any damages or anticipated profits on account of the work being stopped, or for any work done during the interval of suspension. It will, however, pay the Contractor for expense of men necessarily retained during the interval of suspension, provided the Contractor can show that it was not reasonably practicable to move these men to other points at which they could have been employed. The Company will further pay the Contractor for time necessarily lost during such suspension at the rate of.....per cent per annum on the estimate value of materials, equipment and fixtures furnished by the Contractor on the work which are necessarily idle during such suspension, said rate of.....per cent per annum being understood to include depreciation, interest and insurance, but if the work, or any part thereof, shall be stopped by the notice in writing aforesaid, and if the Company does not give notice in writing to the Contractor to resume work at a date with..... of the date fixed in the written notice to suspend, then the Contractor may abandon that portion of the work so suspended and he will be entitled to the estimates and payments for such work so abandoned, as provided in Section 25 of this contract.

Forfeiture

21. If at any time the work is not progressing to the satisfaction of the Engineer, he may so notify the Contractor in writing, and if the progress of the work fails to show an immediate improvement satisfactory to the said Engineer, he may, at his discretion, for the failure to prosecute the work with an adequate force, for non-compliance with orders as to the manner of performing it, or for any omission or neglect of, or failure to comply with any of the requirements of this agreement, on the part of the Contractor, declare this contract forfeited, which declaration of forfeiture, made in writing and served upon the Contractor, shall exonerate the Company from any and all liabilities and obligations arising under this contract, and any balance due the Contractor on account of work done shall be forfeited to the Company, and the Engineer shall have full power to enter upon and take possession of the work, and to contract with any other person or persons for its completion.

Replacement of Defective Parts

22. The Contractor shall replace promptly at his own expense any part or parts of the apparatus and material furnished under this contract which within a period of one year after the date of final acceptance of the work shall fail to perform its proper functions because of any defect in the design, construction or installation of said apparatus or material.

Patents

23. The Contractor hereby covenants and agrees to indemnify and save harmless the Company of and from all loss, damage, claims, suits, recoveries or judgments, which may arise or be made, had, brought or recovered by reason of or on account of the material, tools, implements, machinery, fixtures, or anything used in or about the work to be performed under the contract, being infringements, or being claimed to be infringements, of letters patent issued by the United States or any foreign country.

Payments

24. Payments for work covered by this contract shall be made in the following manner.....
.....
.....
.....

Final Payment

25. Upon the completion of the work, the Engineer shall certify that all of the work comprehended under this contract has been completed and accepted by him under the terms and conditions thereof, whereupon the entire amount found to be due the Contractor shall be paid to the Contractor at.....within..... days after date of said certificate, provided, however, that before final payment is made, the Contractor shall submit evidence satisfactory to the Engineer that all payrolls, material bills, and outstanding indebtedness in connection with this work, have been paid.

This agreement shall inure to the benefit of and be binding upon the legal representatives and successors of the parties respectively.

In Witness Whereof, the parties hereto have executed this agreement in.....the day and year first above written.

Witness:

.....
.....

Committee: R. C. Johnson (B. R. T.), chairman; H. F.

Haag (U. S. R. A., Southwestern Region), vice-chairman; Hadley Baldwin (C. C. C. & St. L.), H. S. Balliet (Grand Central Ter.), George Boyce (C. St. P. M. & O.), R. L. Davis (M. C.), W. H. Elliott (N. Y. C.), A. R. Fugina (L. & H.), R. L. Huntley (U. P.), J. B. Latimer (C. B. & Q.), John Leisenring (Ill. Traction), H. F. Lomas (I. C.), J. A. Peabody (C. & N. W.), E. B. Pry (Penna., Lines West), J. M. Waldron (I. R. T.).

Discussion

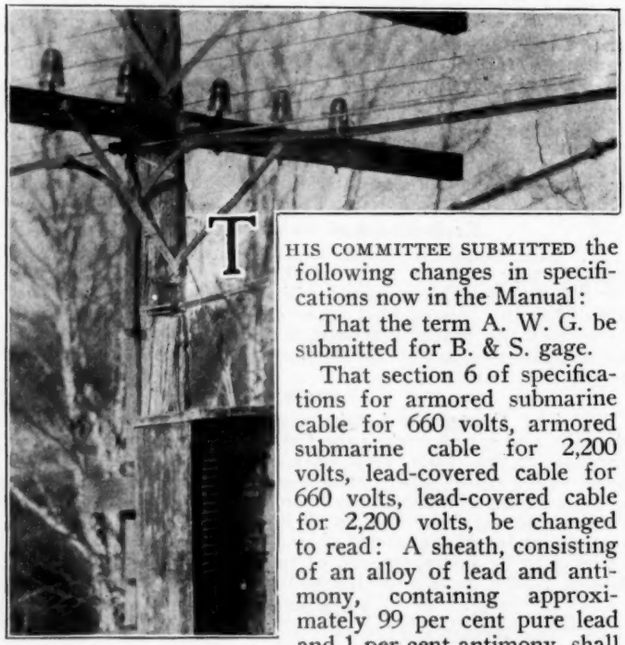
The Secretary: The committee on contracts has only a progress report to make, and the chairman is not present. At his request I suggest every member of the association who has any suggestions whatsoever on the proposed contract—a good many legal questions are involved—and in the absence of practically all of the leading members of this committee, write to the chairman of the committee directly, and to the vice-chairman, forwarding a carbon copy, between now and not later than March 29, 1919, with any suggestions, objections or criticisms that any of the members have to make to this report.

W. H. Elliott (N. Y. C.): I object to the form of contract, for the reason that it represents only one side, the engineer or railroad company, leaving out any consideration for the contractors' interest.

L. F. Howard (U. S. & S. Co.): Are the manufacturers to have an opportunity to have a conference with the committee before the June meeting?

The Secretary: A careful study has been made by a number of gentlemen who have thought the matter over, and they felt they had not sufficient time to digest such a document. Now, the opportunity is given to every one interested to present their views between now and March 29, and immediately after that date the committee will hold another meeting and it is their desire to have present every one they can get hold of to assist in the discussion and develop these contracts into final form.

Report of Committee IX—Wires and Cables



THIS COMMITTEE SUBMITTED the following changes in specifications now in the Manual:

That the term A. W. G. be submitted for B. & S. gage.

That section 6 of specifications for armored submarine cable for 660 volts, armored submarine cable for 2,200 volts, lead-covered cable for 660 volts, lead-covered cable for 2,200 volts, be changed to read: A sheath, consisting of an alloy of lead and antimony, containing approximately 99 per cent pure lead and 1 per cent antimony, shall be applied over the assembled and taped conductors, etc.

That the specification for friction tape be revised to read as follows:

1. General

(a) The tape shall be made of cotton sheeting which is thoroughly impregnated on both sides with a friction rubber compound. The edges of the tape shall be straight and the width even. No pin holes should be observable when the tape is held before a strong light. 1914.

(b) Unless otherwise specified, the tape shall be ¾-in. width. 1919.

2. Friction Rubber Compound

(a) The compound shall have a rubber base and be of the strength and insulating qualities required to meet the specified physical and electrical tests. 1914.

(b) The compound shall be free from active sulphur or other substances which will act injuriously on copper or the cotton tape. 1914.

3. Cotton Tape

The cotton tape shall be cut from sheeting well, evenly and firmly woven from good cotton and free from defects, dirt, knots, lumps and objectionable irregularities of twist. The warp of the fabric shall extend lengthwise of the tape and the tape shall not ravel continuously when unwound from the original roll. 1914.

4. Tests

(a) Manufacturer shall give the purchaser sufficient notice of time when material will be ready for testing. (S. S. T.-a.) 1916.

(b) Manufacturer shall provide, at point of production, apparatus and labor for making the required tests under the supervision of the purchaser. (S. S. T.-b.) 1916.

(c) Tests may be made at point of production, or on samples submitted, and may also be made at destination. (S. S. T.-c.) 1916.

(d) Tests shall be made from samples taken from any part of any roll. 1919.

5. Physical Tests

(a) The finished tape shall be unwound from the original roll and wound in concentric layers for a distance of 12 in. at a rate not to exceed 2 ft. per minute upon a ¼ in. mandrel under a tension of 7½ lb. for ¾-in. width. 1919.

(b) Tape shall then be unwound under a tension of 3 lb. for ¾-in. width. 1919.

(c) The adhesion between the plies shall be such that the rate of separation after 2 in. have been unwound shall not exceed 10 in. in 3 min. 1919.

6. Tensile Strength

(a) The tensile strength of the tape shall be not less than 30 lb. for ¾-in. width. 1914.

(b) The test for tensile strength shall be made on a piece of tape 12 in. in length between grips and stretched at the rate of 10 in. a min. 1919.

7. Heat Test

(a) Strips of tape 18 in. in length, taken from the original roll, shall be exposed to a dry heat of approximately 210 degrees F. for 16 hr. 1919.

(b) Immediately upon removal from the heat, the strips shall be wound in concentric layers for a distance of 12 in. upon a ¼-in. mandrel at a rate not to exceed 2 ft. a min. under a tension of 7½ lb. for ¾-in. width. 1919.

(c) Tape shall then be unwound under a tension of 1½ lb. for ¾-in. width. 1919.

(d) The adhesion between the plies shall be such that the rate of separation after 2 in. have been unwound shall not exceed 10 in. in 3 min. 1919.

8. Electrical Test

(a) The tape shall stand a potential strain of 1000 volts (effective value) 60 cycles applied for 1 min. by placing a section of tape between two brass ball electrodes each ¾-in. in diameter. The electrodes shall be spaced so that tape will just move between them. 1919.

(b) The voltage shall be gradually increased, after tape has been placed between electrodes, until limiting value is attained. 1919.

9. Inspection

(a) Purchaser will make such inspection of the completed product as to assure him that the requirements of the specification have been met. (S. S. I.-a.) 1916.

(b) Purchaser may make desired inspection at all stages of manufacture. (S. S. I.-b.) 1916.

(c) If, upon arrival at destination, the material does not meet the requirements of this specification, it may be rejected and returned to the manufacturer, who shall pay all freight charges. (S. S. I.-c.) 1916.

10. Packing

(a) Material shall be packed so as to permit convenient handling and to prevent loss or damage during shipment. (S. S. P.) 1916.

(b) The tape shall be furnished in rolled strips having the following dimensions and weight:

Width, Inches	Approximate Thickness	Minimum Length per Pound	Weight per Roll, Pounds
½	.015	135 ft.	0.33
¾	.015	90 ft.	0.5
1	.015	67.5 ft.	0.67
1½	.015	45 ft.	1.0
2	.015	33 ft.	1.34

1919.

(c) Each roll shall be enclosed in a tin box or wrapped in tin foil and enclosed in a box to secure and fully protect the contents. 1914.

(d) Each package shall contain the full specified weight of tape, exclusive of wrapping and boxes, and shall be marked with the manufacturer's name, the width of the tape and its weight. 1914.

11. Marking

Purchaser's order and requisition number, name of consignor and name and address of consignee, shall be plainly marked on outside of package. (S. S. M-a.) 1916.

Committee: W. H. Elliott (N. Y. C.), chairman; C. D. Cronk (N. Y. C.), W. L. Dryden (S. I. Rap. Trans.), B. F. Oler (P. R. R.), A. H. Rice (D. & H.), D. W. Richards (N. & W.).

Discussion

W. H. Elliott (Chairman) presented the report. On motion, the substitution of the term "A. W. G." for "B. & G. gauge" in the specification was approved, and also the specifications for armored submarine cable, for 2 voltages, and lead-covered cable for 2 voltages. The specifications for friction tape was then put to vote and carried, and the committee was excused with thanks.

Creosoting Wood Signal Trunking to Extend Its Life

The use of creosote for preserving trunking has been considered by the association in the past and the question is one requiring more attention at the present time. In this connection a paper was presented before the association by Kurt C. Barth, technical representative of the Barrett Company, Chicago. Several samples of trunking and capping treated as recommended were submitted at the March meeting of the association, together with the paper. This paper follows:

The purpose of this paper is to submit this subject for consideration and discussion; to make a brief mention of the available information, and particularly to suggest to the Railway Signal Association further careful study. No effort has been made to support certain statements or data, as it is expected that will be developed during committee sessions.

Briefly, the premises for discussion are:

First: It is known that wood trunking, capping and posts decay rapidly, obviously resulting in increased maintenance. The average physical life of untreated trunking can be said to approach four to five years for Douglas fir; two to six years for Southern yellow pine, depending upon grade, and as regards cypress, I would prefer to leave the value of its "eternal" qualities to the judgment of those who have used it.

Second: I have been informed that the average mechanical life of high grade signal wire is said to be about 12 years, varying from four to five years at interlocking plants, where laid adjacent to rails, from 18 to 20 years where not exposed to severe strain. Thus, it is obvious that an increase in the natural life of trunking to about that of the average mechanical life of wire is very desirable, and would mean a considerable saving.

Third: The logical remedy is to employ preservative treatment. The preservative to be considered is coal-tar creosote oil. The available methods are both pressure and non-pressure, although the latter is more adaptable because a refined oil is used and lighter treatments given.

Fourth: The use of coal-tar creosote oil has been seriously objected to because of the belief, based on experience to a certain extent, that creosoted trunking bleeds, and the free creosote oil which thus exudes will rapidly deteriorate the insulation of the wire, causing interruption to service, etc.

If this fact is substantiated, and no remedy found for the condition complained of, then the preservative treatment of trunking may be impracticable. I believe, however, that a surface treatment with refined coal-tar creosote oil would increase the life of the trunking and parts, without the slightest threat of injury to insulating compositions of good quality.

Fifth: Extracts of expressions from various sources are appended as appendix "A." It is evident that there exists considerable difference of opinion regarding this matter, but none sufficiently serious to preclude arriving at a practical solution. It is hoped in this connection that the co-operation of the wire manufacturers will be had, and that they will endeavor to aid rather than obstruct efforts which may be expended to solve the problem.

Sixth: Surface treatments with refined coal-tar creosote oil (conforming to specification No. R-828A, U. S. Railroad Administration) should be employed for signal trunking, capping and support posts, and when properly conducted, bleeding should not occur. Such treatment should consist of immersion of the trunking, after having been completely manufactured, in refined coal-tar creosote oil maintained at a temperature between the minimum and maximum limits of 150 degrees F. and 200 degrees F. for from 15 min. to 30 min., depending upon species and the grade of wood used. (Steam coils to be used for heating oil.)

Where strictly permanent work is under consideration, and the type of construction warrants the cost, and a more thorough impregnation of the trunking is desirable, and in that event treatment with refined coal-tar creosote oil by the open-tank process (hot and cold treatment) is recommended. The trunking should then be pitched, as heavy treatments may result in a slight bleeding, even of refined oil, although it is to be understood that refined creosote is far less likely to cause trouble or injure the insulation than when the commercial grades of creosote are used for trunking treated by the pressure process. The primary danger is not the treatment in itself, but the possibility that the lower boiling fractions of coal-tar creosote oil will bleed from the trunking as the result of supersaturation during treatment, and collect in sufficient quantities to act as a solvent on the insulation. As these lower boiling fractions are largely removed from the refined creosote, which is herein recommended for treatment of trunking, and as surface treatments do not thoroughly impregnate the lumber, but merely coat the surface, the danger of deterioration is minimized, while if the treatments recommended are properly con-

ducted, this is entirely eliminated. Where treatment is given in the field, a refined creosote shall be liquid at ordinary working temperature, and as it is practically non-volatile the usual difficulty of solidification of the oil and evaporation are removed. It is my belief, furthermore, that when the cut ends of the trunking are brush-treated in the field, and a little oil is accidentally splashed or dropped on the trunking, no harm will result, because of the exceptional purity of a proper refined creosote.

In conclusion I suggest that this matter be referred to a standing committee, or a special committee for further careful study, as it is quite self-evident that the economy resulting from preservative treatment with refined coal-tar creosote oil is decidedly worth while. In fact, the benefits are at least two-fold. First, extension of the period of service of trunking, of the wire, and practically everything else involved. Second, it is much cheaper to use refined creosote than the cheapest paint.

Extract From Proceedings of R. S. A. for 1908

Page 81.

Appendix "A."

Mr. B. H. Mann: In connection with Mr. Stevens' remarks I would like to ask if some one has not had some experience with treated conduit. My experience is that a conduit where it was not treated, particularly where it crosses a track and must be in the ground four or five years, that when renewing trunking you will have to handle the wire, that is, you will have to take your rubber tube out and bend it, which is not a good thing for that rubber tube at that age. Has not some one had some experience with creosoted conduits or some other treatment, particularly in connection with the rubber-covered wire, that we may have the advantage of it and still do something with Mr. Stevens on this trunking proposition?

The President: The Northwestern are using a great deal of the bituminous conduit.

Mr. Rosenberg: For Mr. Mann's information I would say that I have had considerable experience with creosoted trunking and will say that as it ages, it gets harder and firmer, the only objection that I find with it is, that after eight or ten years, when you undertake to take it apart, to get inside of the trunking, it is a hard matter to nail it together again; it will split, gets to be the nature of bone, but if it is left to remain without taking it out, it will never rot and will last fifty years or longer.

Mr. Mock: We had one time an installation that required an impregnated trunking. I am sure that it was creosoted, but we took it up with a wire manufacturer and he advised that he would not guarantee the wire, if we used that trunking, explaining that it would act on the rubber insulation in such a way as to reduce its life considerably. It is possible that there is something on the market now that would be better than treated lumber.

The President: I believe the experience of the Lackawanna was that the creosoting did interfere with the rubber insulation; made it punky.

Mr. Stevens: That is, if the wire was not protected by pitch.

The President: Yes, if you put creosoted trunking in and then pitch your wire in, you ought to have a good piece of work.

Mr. Stevens: Underground trunking properly treated, heavy enough to stand mechanical strains, and the wire laid in properly, the trunking pitched before the wires are laid in, and the trunking afterwards filled up with pitch will be the ultimate wire construction for all electric work, but I do not look to see that now.

Quotation From Letter Written by Commercial Creosoting Plant

We find a very prevalent impression that the insulation will deteriorate in contact with creosoted lumber, and it is, of course, a fact that rubber suffers in contact with liquid creosote oil.

It has never been proven to our satisfaction that there is sufficient free oil exuding from creosoted trunking or conduits to damage the ordinary insulation on signal wires, and on account of this fact we find the prevalence of this impression may be due to unwarranted statements made by competing firms of conduit.

Opinion of an Electric Illuminating Company

Question: Do you fear that the insulation of cable or wire would be affected by coming in contact with the creosoted conduit?

Answer: No.

Discussion

G. A. Guyer (N. Y. C.): I am told that it is almost impossible to obtain creosote oil at the present time in sufficient quantities to take care of all ties that are to be treated, and I wondered if the zinc treatment that is being used for preservation would in any way affect the insulation on our wires.

Mr. Barth: I don't see why there would be any objection to using zinc as long as it does not interfere with the operation of your apparatus. That is a question I cannot answer. As far as procuring creosote, you will understand that I have recommended surface treatment, of which I am primarily speaking, that oil meeting the specification of the United States Railroad Administration, and it can be obtained in reasonable quantities at the present time.

O. R. Unger (Mo. Pac.): I wish to state that the Missouri Pacific have renewed 42 miles with creosoted lumber, and practically used all new wire, and in eight months the result was that you could strip it off with your finger.

C. R. Hodgdon (C. P. R.): We have been using a refined creosote oil, putting it on with a brush. We have had some in service about two years, and we have seen no ill effects from it.

The President: I wish to extend a vote of thanks to Mr. Barth for his paper. (Applause.)

Santa Fe Signal Supervisors' Reunion

The fifth annual luncheon of the past and present members of the Santa Fe Signal Supervisors Committee was held in the French room of the Congress Hotel Monday noon. Those present were: T. S. Stevens, signal engineer; L. Brown, Sr., assistant signal engineer; G. K. Thomas, Jr., assistant signal engineer, and E. Hanson, signal supervisor, all of the Atchison, Topeka & Santa Fe; G. R. Cowherd, signal engineer, El Paso & Southwestern; B. T. Anderson, assistant signal engineer, Delaware, Lackawanna & Western; Harold K. Ferguson, Austin Company, and J. S. Hobson and J. E. Saunders of the Union Switch & Signal Company.

On the second page of the souvenir menu was a photograph of H. Hobson, signal supervisor of the Santa Fe at Topeka. The last page contained the following poem:

"What we have we'll hold," meant lands and gold,
When we strove in the days gone by.
But now we fight for freedom's right,
And we'll hold the right or die.

Signal Division Registration

The registration of signal men at the meeting of the Signal section of the American Railroad Association yesterday aggregated 319, the largest in the history of the Association. It compares with 198 for the same day last year.

*Members in Military and Naval Service.

Active Members

Ackerman, F. J., Sig. Engr., Kansas City Terminal Ry., Room 216, Union Station, Kansas City, Mo.
Alexander, A. F., Sig. Supr., C. M. & St. P. Ry., Room 8, Milwaukee Depot, Minneapolis, Minn.
Allan, T. A., Chf. Sig. Inspr., Grand Trunk Ry., Room 514, Canadian Express Bldg., Montreal, Que.
Allen, G. H.
Ambach, E. T., Engr. of Sigs., B. & O. R. R., Western Lines, Room 400, Central Union Depot, Cincinnati, Ohio.
Anderson, B. T., Asst. Sig. Engr., D. L. & W. R. R., Hoboken, N. J.
Anderson, James, Sig. Inspr., N. Y. C. R. R., West of Buffalo, 2525 Carnegie Ave., Cleveland, Ohio.
Ashley, Robin D., Sig. Inspr., I. C. R. R., Central Sta., Chicago, Ill.
Bagley, F. H., Asst. Sig. Engr., L. & N. R. R., Room 805, L. & N. Bldg., Louisville, Ky.
Baird, M. A., Sig. Engr., Erie R. R., 50 Church St., New York, N. Y.
Baker, N. E., Supt. Tel. and Sigs., Grand Trunk Ry. System, 23 Quincy St., Detroit, Mich.
Baldwin, Hadley, Asst. Chf. Engr., C. C. C. & St. L. Ry., Cincinnati, Ohio.
Ball, Frank L., Supr. Sigs., D. L. & W. R. R., 33 Burnett St., Maplewood, N. J.
Balliet, H. S., Secretary-Treasurer, Asst. Term. Mgr., Grand Central Terminal, Room 1612, G. C. T. Bldg., New York, N. Y.
Baxter, H. H., Supt. Constr., Sig. Dept., C. & N. W. Ry., Jackson Blvd., Chicago, Ill.
Beaumont, J., Sr. Tel. & Sig. Engr., Valuation Board, I. C. C., Karpen Bldg., Chicago, Ill.
Beck, Geo. E., Asst. Sig. Engr., Val., N. Y. C. R. R., West of Buffalo, Cleveland, Ohio.
Bell, W. I., Supr. Sigs., W. J. & S. R. R., Camden, N. J.
Bennett, C. H., Sig. Supr., L. & H. R. Ry. Co., Warwick, N. Y.
Black, E. A., Sig. Supr., N. Y. C. R. R., West of Buffalo, 118 Prospect St., Ashtabula, Ohio.
Boland, W. E., Sig. Engr., Sou. Pac. Co., 1116 Flood Bldg., San Francisco, Calif.
Borland, W. P., Asst. Chief, Bureau of Safety, I. C. C., 1806 Kenyon St., Washington, D. C.
Bolin, W. C.
Blitz, Edgar.
Breecher, A. T., Sig. Supr., C. M. & St. P. Ry., Box 705, Savanna, Ill.
Brown, Chas. W., Supt., L. & N. E. R. R., Bethlehem, Pa.
Buchanan, F. H., Sig. Engr., Penna. Lines West, Pittsburgh, Pa.
Burns, Wm. G., Asst. Circuit Engr., N. Y. C. R. R., East of Buffalo, Albany, N. Y.
Burrell, C. F., Engr., M. of W., K. & I. Term. Ry. Co., 2910 High St., Louisville, Ky.
Byers, Dwight, Sig. Inspr., N. Y. C. R. R., West of Buffalo, 9501 Cedar Ave., Cleveland, Ohio.
Caley, Glenn H., Elec. and Sig. Engr., N. Y. O. & W. Ry., Middletown, N. Y.
Camp, W. M., Editor, "Railway Review," Ellsworth Bldg., Chicago, Ill.
Canavan, Chas. E., Asst. Sig. Supr., U. P. R. R., Topeka, Kan.
Carpenter, L. E., Inspr. Sigs., P. R. R., Broad St. Sta., Philadelphia, Pa.
Case, D. M., Sig. & Elec. Engr., Sou. Ry. Lines West, Cincinnati, Ohio.
Childs, W. L.
Champlin, E. F., Sig. Supr., Erie R. R., 315 W. Clinton St., Elmira, N. Y.
Charlton, Robt. C., Supr. Sigs., O. W. R. R. & Nav. Co., Portland, Ore.
Christofferson, C. A., Sig. Engr., Nor. Pac. Ry., St. Paul, Minn.
Connors, Wm. L., Asst. Sig. Engr., B. R. & P. Ry., 511 W. Long Ave., Du Bois, Pa.
Conway, C. J., Sig. Engr., Detroit United Rys., 82½ Tireman Ave., Detroit, Mich.
Cooper, S. F., Sig. Supr., Erie R. R., Jersey City, N. J.
Corcoran, John J., Asst. Engr., N. Y. C. R. R., East of Buffalo, care of Sig. Engr's Office, Albany, N. Y.
Cormick, James H., Director, Sig. Engr., Can. Nor. Ry., Union Sta., Winnipeg, Man.
Cotton, Chas. A., Div. Sig. For., A. T. & S. F. Ry., Chillicothe, Ill.
Cowherd, G. R., Sig. Engr., E. P. & S. W. Ry., Room 704, Southwestern Bldg., El Paso, Texas.
Crantford, H. B., Sig. Supr., C. M. & St. P. Ry., Deer Lodge, Mont.
Cronk, C. D., Asst. Sig. Engr., N. Y. C. R. R., West of Buffalo, Cleveland, Ohio.
Dahlstrom, A. H., Supr. Sigs., U. P. R. R., Room 19, Union Depot, Denver, Colo.
Dahlstrom, H. R., Sig. Supr., U. P. R. R., Cheyenne, Wyo.
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Railway Signal Association Men Engaged in the War

A Comparative Statement and Classification of Members Who Served, With Activities of Some

WHEN THE ARMISTICE was signed on November 11, 1918, there were 74 members of the Railway Signal Association in various branches of the military and naval service. These men on the R. S. A. honor roll who responded to their country's call represented about 5 per cent of the present membership of the association, which is approximately 1,250. At the present time the Railway Signal Association has 706 active, 202 junior and 332 associate members. The honor roll of 74 names includes 33 active, 22 junior and 19 associate members. These men have served in the past as committee chairmen or vice-chairmen and as members of various committees and have aided in other ways to promote the interests of the association. Their participation in the war has been none the less active, and the high quality of the service they have rendered is characteristic of their conduct in the R. S. A. A brief outline of the activities of those men in the war whose records we have received is of interest and is given below.

The R. S. A. Service Flag

Capt. E. L. Adams, formerly senior signal engineer, Bureau of Valuation, Southern district, Interstate Commerce Commission, with headquarters at Chattanooga, Tenn., was called into military service as a captain of engineers in the Engineer Officers Reserve Corps on September 3, 1917. He was ordered to Fort Leavenworth, Kan., for training and on December 5 of that year was attached to the 112th Engineer Regiment at Camp Sheridan, Montgomery, Ala. In January, 1918, he received orders for overseas duty and arrived in France about one month later. He has since traveled over a large part of France in connection with his official duties and says, "I have been handed around to various outfits ever since I came over, making short stops with each." During his travels from place to place he had a chance to observe some of the signaling on part of the roads in central France. He says that the signals are operated by wire with very elaborate compensating arrangements and that the switches are operated by pipes, but with no facing point locks or switch and lock movements. They also operate cross-overs from one end with nothing to indicate the movement of the switchpoints. All trains are operated on absolute block, and a rather simple and ineffective lock and block instrument is used.

Major Azel Ames, Jr., who recently resumed his associations with the Kerite Insulated Wire & Cable Company at New York after receiving his discharge on January 17, 1919, was called into military service on July 15, 1917, with the 8th Coast Defense Command, National Guard, New York. The following month he was transferred into the United States army and served at Fort Wadsworth, New York Harbor, until the end of the year, following which he attended a coast artillery school at Fortress Monroe, Va., during January and February, 1918, and helped organize heavy artillery regiments located at Fort Screven, Ga.; Fortress Monroe, Va., and Camp Abraham Eustis, Va. He served with the 61st, the 75th and the 41st Artillery, C. A. C.

Major R. F. Morkill, formerly signal engineer of the Grand Trunk at Montreal, Que., enlisted in the Canadian army as a supernumerary second lieutenant in the Canadian Engineers early in October, 1914. He had served previously in the South African war as lieutenant with the Canadian Mounted Rifles. Immediately following his enlistment he was sent to England and during the winter of 1914 and 1915 he helped build the camp at Salisbury Plain and did searchlight work along the English coast. Early in 1915 he was ordered to France and took part in the second battle of Ypres on April 22-24. Two months later he became a captain and was transferred to the Royal Engineers, following which he was ordered to England to command and train a company, and was so engaged until the latter part of December of

the same year, when he again returned to the front with his company. In the New Year's honors of January, 1917, he was presented with the Military Cross. Later he was promoted to Major of the Royal Engineers and attached to the staff of the Director General of Transportation and given charge of the signaling with the title of signal engineer on the British railways in the occupied portions of France and Belgium. In this connection he put in something over 700 levers besides restoring and afterwards maintaining many plants which had been damaged by shell fire.

Lieut. Robert H. Phinney, formerly assistant engineer in the signal department of the Chicago & North Western, enlisted in the 415th Railway Telegraph Battalion in December, 1917. The battalion was mobilized in January, 1918, and was stationed in Chicago until the latter part of February, at which time it sailed for France via England, arriving there about the second week in March. He was in charge of supplies for the battalion and the latest reports indicate that he still serves in that capacity. The work of the battalion consists of building and maintaining military telegraph and telephone lines.

Lieut. C. D. Symes, formerly signal inspector on the Duluth, Winnipeg & Pacific, at Virginia, Minn., entered military service immediately after the United States declared war. Previous to coming from Great Britain to the United States in 1911 he had had considerable training in the London Volunteers, and when he offered his service in the United States army he received a commission as first lieutenant and was ordered to Fort Leavenworth for training. In February, 1918, he was sent overseas, where he soon became engaged in active service. He was awarded the Croix de Guerre and has twice been mentioned in divisional citations, these citations being as follows:

First Lieut. Clarence D. Symes, Company "D," 1st Engineers, displayed absolute disregard for personal danger in assisting in saving an ammunition dump that was burning. It was by his splendid example that the men worked fearlessly and succeeded in saving a great amount of ammunition. Between the Argonne and the Meuse.

First Lieut. Clarence D. Symes, Company "D," 1st Engineers, displayed splendid qualities of leadership and good judgment in handling his men and showed absolute disregard for personal danger throughout the advance, going ahead of the tanks in several instances in the face of heavy enemy machine gun fire. St. Mihiel Salient.

In the early part of this year Lieut. Symes was transferred from the 1st Engineers to the Inter Allied Railway Commission and was appointed signal engineer to the commission (American sector), American Army of Occupation.

Major W. M. Vandersluis received his commission as captain in the Engineer Officers Reserve Corps on June 13, 1917. He was ordered to the Fort Leavenworth training camp on September 5, 1917, and in December, 1917, he was attached to the 35th Engineers at Camp Grant, Rockford, Ill. The following month he was ordered to overseas duty and arrived in France on February 18, 1918. Most engineering officers received further training in a school operated by the 116th Engineers at Angers, France, and Major Vandersluis was stationed there for a time. For about two weeks in March, 1918, he was placed in charge of a casual company at Blois, France, and on April 2 he was assigned to work under the Chief of Utilities in the Motor Transport Corps, where he served continuously until his discharge on February 20, 1919. He also served about six weeks as signal engineer, in November and December, 1918, with the Transportation Corps. He received his appointment as Major in the Motor Transport Corps on October 7, 1918.

The following list of members are serving or have served in some branch of military or naval service. The list includes the positions they held before entering the service:

Active Members

E. L. Adams, senior signal engineer, Interstate Commerce Commission, Chattanooga, Tenn.
W. G. Atwood, assistant district engineer, Interstate Commerce Commission, Chattanooga, Tenn.
A. M. Bears, signal supervisor, Canadian Pacific, Winnipeg, Man.
Angus Beaton, acting signal supervisor, Canadian Pacific, Winnipeg, Man.
P. A. Bliss, signal supervisor, Southern Pacific, Ogden, Utah.
E. N. Bousquet, signal inspector, New York Central, Cleveland, Ohio.
C. W. Cochran, engineer maintenance of way, Cleveland, Cincinnati, Chicago & St. Louis, Galion, Ohio.
William Crawford, signal engineer, Oren Electric Lines, Salt Lake City, Utah.
A. C. Everham, terminal engineer, Union Pacific, Kansas City, Mo.
P. W. Gage, signal supervisor, Chicago, Burlington & Quincy, La Crosse, Wis.
R. C. Gardner.
M. L. Goehringer, signal supervisor, Missouri Pacific, Nevada, Mo.
Wm. C. Lancaster, electrical engineer, Canadian Northern, Montreal, Que.
W. Landesberg, assistant traffic manager, Moscow-Kazan Railroad, Moscow, Russia.
Stanley W. Law, assistant signal engineer, Northern Pacific, St. Paul, Minn.
E. R. Lindsey, signal inspector, Chicago & Eastern Illinois, Chicago.
F. M. Loud, signal engineer, Public Service Railway, Newark, N. J.
C. A. Lyon, general signal inspector, New York Central & St. Louis, Nashville, Tenn.
M. P. Martin, signal inspector, Illinois Central, Chicago.
R. F. Morkill, signal engineer, Grand Trunk, Montreal, Que.
Wm. B. Nichol, assistant engineer, Boston & Albany, Boston, Mass.
E. T. Owens, associate editor, *Railway Signal Engineer*, Chicago.
G. C. Parsons, superintendent building construction, Twin City Rapid Transit Company, St. Paul, Minn.
A. J. Patterson, junior signal engineer, Interstate Commerce Commission, Washington, D. C.
L. M. Perrin, senior signal engineer, Interstate Commerce Commission, San Francisco, Cal.
R. M. Phinney, assistant engineer, Chicago & North Western, Chicago.
G. A. Rodgers, chief draftsman, Wabash, Decatur, Ill.
N. Roginsky, assistant superintendent telegraph, Moscow-Kazan Railway, Moscow, Russia.
O. B. Ruggles, signal supervisor, Boston & Maine, Salem, Mass.
Charles Stebbins, Jr., assistant supervisor, Richmond & Chesapeake Bay, Richmond, Va.
C. D. Symes, signal inspector, Duluth, Winnipeg & Pacific, Virginia, Minn.
W. M. Vandersluis, signal engineer, Illinois Central, Chicago.
A. J. Yarrell, signal inspector, Chicago, Indianapolis & Louisville, Bloomington, Ind.

Junior Members

Sam Black, signal shop foreman, Chicago & North Western, Madison, Wis.
E. Bouchet, signal foreman, Chicago, Milwaukee & St. Paul, Avery, Idaho.
Wm. H. Claus, draftsman, Illinois Central, Chicago.
D. K. Crawford, draftsman, Gulf, Colorado & Santa Fe, Topeka, Kan.
Homer Dunn, draftsman, Santa Fe Coast Lines, Los Angeles, Cal.
C. L. Falk, maintainer, Wabash, St. Louis, Mo.
Theo. Groth, maintainer, Chicago, Milwaukee & St. Paul, Tacoma, Wash.
John S. Hall, transportation student, Canadian Pacific, Montreal, Que.
Wm. Heard, signal foreman, Union Pacific, Green River, Wyo.
H. E. Johnson, signal foreman, Toledo & Ohio Central, Columbus, Ohio.
C. B. Keers, signal construction foreman, Atchison, Topeka & Santa Fe, Topeka, Kan.
Roy Kimple, draftsman, New York Central, Cleveland, Ohio.

Earl Perkins, wireman, St. Louis, Iron Mountain & Southern, Mineral Point, Mo.
S. E. Rollins, draftsman, Illinois Central, Chicago.
F. J. Ryans, signal draftsman, Illinois Central, Chicago.
D. A. Scarnickia, draftsman, Grand Trunk, Montreal, Que.
W. A. Schrader, Wabash, Decatur, Ill.
A. M. Smith, signal maintenance foreman, Erie, Buffalo, N. Y.
L. C. Smith, assistant foreman, Long Island, Jamaica, N. Y.
W. G. Stansel, draftsman, Elgin, Joliet & Eastern, Joliet, Ill.
G. Stevens, construction foreman, Union Pacific, Cheyenne, Wyo.
J. E. Trimble, maintainer, Grand Trunk, Lansing, Mich.

Associate Members

Azel Ames, Kerite Insulated Wire & Cable Company, New York.
C. C. Bailey, signal accessories department, General Electric Company.
Wm. H. Bleecker, sales representative, Page Woven Wire Company.
P. E. Carter, sales engineer, General Railway Signal Company, New York.
P. H. Chapman, manager, National Electric Specialties Company, Toledo, Ohio.
C. M. Deardorff, sales engineer, General Railway Signal Company, Chicago.
E. B. Doane, sales representative, Chicago Railway Signal & Supply Company, New York.
John Featherston, sales department, Union Switch & Signal Company, Swissvale, Pa.
J. H. Finney, manager, Aluminum Company of America, Washington, D. C.
J. W. Hackett, sales engineer, Federal Signal Company, New York.
C. N. Johns, sales agent, Page Woven Wire Company.
R. B. Johnson, assistant engineer, General Railway Signal Company of Canada, Lachine, Province of Quebec, Canada.
John F. Kelly, electrical engineer, Federal Signal Company, Albany, N. Y.
F. Kingsley, associate editor, Electric Railway Journal, New York.
Wm. J. Payne, inspector, Saxby & Farmer Company, Ltd., Montreal, Que.
Paul Renshaw, signal engineer, Federal Signal Company, New York.
E. A. Warner, Jr., commercial department, Union Switch & Signal Company, Swissvale, Pa.
W. W. Wenholz, General Railway Signal Company, Rochester, N. Y.
P. P. Williams, eastern representative, Chicago Railway Signal & Supply Company, New York.

Annual Exhibit of the N. R. A. A. at the Coliseum

The Post War Show Proves Attractive to Delegates and Visitors to the A. R. E. A. Convention

"We will play to a crowded house this year," said C. W. Kelly, secretary of the National Railway Appliances Association and stage manager of the 11th annual exhibit of the association at the Coliseum, which opened yesterday morning. This was a week ago and during the seven days intervening wonders have been accomplished. Another show had been playing in the Coliseum, namely, an organization of Chicago's soldiers recently returned from overseas, which used the building during its sojourn in Chicago as a reception hall. Accordingly, Stage Manager Kelly had to literally "roll up his sleeves and fall to." He marshaled his forces, set the stage hands and decorators to the converting of the drab interior of the Coliseum into a spotless buff and old ivory stage and at the same time helped the principals in the four-day show in work on their convention costumes and in the rehearsal of their respective parts. The whole was welded into a co-ordinated production for the exhibition of appliances used in steam and electric railway operation, construction and maintenance.

There was no hitch in the official opening, as was sometimes the case in the past. The total registration of supply representatives at noon yesterday was 75 more than last year's total registration of 921. At the close of the first day this year there were 160 additional registrants. All exhibitors had their exhibits in place with the exception of one. This has not been the case in the past.

The show in its entirely is, as P. T. Barnum might say, "Bigger and better than ever." The number of active exhibitors continues to increase, five additional appliance companies being added to the total of last year, yet the N. R. A. A. still clings to their re-edited golden rule of "quality and not necessarily quantity." The exhibits themselves are mostly active service appliances, educational rather than showy and all a bit more tastefully arranged, perhaps, in order to show the busy railroad visitor the salient points of the appliances with the least possible expenditure of time. Needless to say, the devices exhibited are ones which have proven their efficiency and success in actual service.

No radical changes have been made in the arrangement or management of the N. R. A. A. show, the acclaim which greeted the handling of last year's exhibit being sufficient to prove the success of the arrangement instituted at that time. However, there has been some change in spirit, due almost wholly to extraneous circumstances, from that of last year. The changes in railroad organization, especially in the personnel of railroad construction and maintenance of way departments, which began with the taking over of the railroads by the government has, of course, continued. Furthermore, the uncertainty of what is to become of the railroads eventually and the admitted precarious financial condition of the railroads has tended to instill in the minds of the engineering executives attending the convention the necessity of making what purchases they are able to make with extreme care. This in turn means a more rigorous investigation of the comparative efficiency and usefulness of different appliances which are necessary to railroad operation and maintenance and which the railroads must buy to a certain extent to maintain operation. All of this reverts to the N. R. A. A. in increased attendance and interest in the products exhibited. Continuing the successful practice of last year, the main entrance to the show is through the annex, which in turn is an integral part of the exhibit. The floor plan of the Coliseum is substantially the same as in previous years, with many firms occupying practically the same space as last year.

Mr. Kelly's statement concerning the expected attendance is not amiss, for the changes in railroad personnel already mentioned and the conditions back of the railroads and the railway supply fields accurately foretold the success of the N. R. A. A. show this year. The opinion, which has been developed during the past two years, that the appliances exhibited at the Coliseum are equally attractive to the executive and the subordinate is now producing results. A fair percentage of the visitors at the Coliseum yesterday were men who hold subordinate positions and certainly their interest in the appliances of the different supply companies is no less than that of the executive who is searching for the best means of extending the money allotted to his department, for it is the subordinate who must use the appliances and whose effi-

Officers of the National Railway Appliances Association

P. C. Jacobs, Vice-President
G. C. Isbester
L. W. Shugg

E. H. Bell, Honorary Director
Merle J. Trees, President
A. P. Van Schaich
T. W. Aishton

C. W. Kelly, Secretary-Treasurer
J. Alexander Brown
E. E. Hudson

ciency is dependent upon their appropriate selection.

The exhibition will, as usual, open every morning at 8:00 a. m., closing at 10:00 p. m., with the exception of the closing day, Thursday, March 20, when the closing hour is set at 6:00 p. m.

A new plan has been instituted this year in the issuing of tickets. This plan, which is essentially the placing of tickets in the hands of those who will be able to distribute them to the greatest advantage, is intended to weed out those who are really not interested in the N. R. A. A. exhibit or who are not in any way connected with the railway or railway supply business and consequently will give more opportunity to the representatives of the supply firms to devote their time to those who are vitally interested in their products. It is believed that before the convention opens tickets were placed in the hands of practically every railroad man who could possibly attend the show and who in any way would be interested in railway appliances and their use.

The officers and members of the Board of Directors of the National Railway Appliances Association for the past year were: President, Merle J. Trees, Chicago Bridge & Iron Works, Chicago; vice-president, P. C. Jacobs, H. W. Johns-Manville Co., Chicago; secretary-treasurer, C. W. Kelly, Kelly-Derby Co., Chicago; honorary director, E. H. Bell, Railroad Supply Company, Chicago. Directors: J. Alexander Brown, Pocket List of Railroad Officials, New York; G. C. Isbester, Rail Joint Company, Chicago; E. E. Hudson, Waterbury Battery Company, Waterbury, Conn.; T. W. Aishton, National Malleable Casting Company, Chicago; A. P. Van Schaick, Lackawanna Steel Company, Chicago; L. W. Shugg, General Electric Company, Schenectady, N. Y.

Merle J. Trees, president of the association, is vice-president and general manager of the Chicago Bridge & Iron Works, Chicago. He was born at Mayview, Ill., on June 14, 1883. After graduating from the University of Illinois in 1907, Mr. Trees entered the employ of the Chicago Bridge & Iron Works and his whole business career since that time has been with this company. In 1909 he was appointed sales engineer and in 1911 he became manager of the Chicago sales office. In 1913 he was appointed general sales manager and in June, 1917, was appointed vice-president and general manager, which position he holds at the present time.

List of Exhibitors

The following is a list of the firms presenting exhibits, with the devices on display and the names of the representatives present at their booths:

Adams Motor & Manufacturing Company, Chicago.—Gasoline inspection motor cars. Represented by W. E. Adams, R. A. Harris, L. Gerhardt and A. P. Grenier. Spaces 218 and 218½.

Adams & Westlake Company, Chicago.—Signal lamps; long time burners; switch locks; lanterns; railway station and platform lamps. Represented by W. H. Baldwin, A. S. Anderson, C. B. Carson, W. J. Piersen, H. G. Turney, J. F. Stender, Wm. S. Hamm and G. L. Walters. Spaces 87, 88, 106 and 107.

A. G. A. Railway Light & Signal Company, Elizabeth, N. J.—Railway grade crossing signal; highway danger signal; daylight signal; unison flash signal. Represented by J. K. Howard, A. G. Shaver, O. E. Berggren and H. J. Johnson. Spaces 39 and 40.

Air Reduction Sales Company, New York.—Oxy-acetylene generator; oxy-acetylene welding and cutting torches and apparatus; welding and cutting supplies; special apparatus for frog welding. Represented by E. L. Mills, A. S. Kinsey, R. A. Sossong, J. A. Warfel, B. N. Law, Fred Wyman, Sam Shayken, C. Wallin, M. M. Weist, W. W. Howard and F. G. Gorke. Spaces 7 and 8.

The Alexander Milburn Company, Baltimore, Md.—Portable carbide lights; oxy-acetylene welding and cutting apparatus. Represented by J. A. Schreiber, C. R. Pollard, E. C. McNutt and D. Bartlett. Space 14.

Alger Supply Company, Chicago.—Kerosene snow melting outfits; switch fittings; trunking supports; signal devices. Represented by O. S. Flath and J. M. Fitzgerald. Spaces 167, 167½ and 168.

American Abrasive Metals Company, Chicago.—"Feralun" anti-slip treads for passenger coach steps. Represented by H. W. Mowery, C. A. Barker, L. A. Hale and R. L. Brown. Space 15.

American Hoist & Derrick Company, St. Paul, Minn.—"American" railroad ditcher. Represented by F. J. Johnson, W. O. Washburn, Edward Coleman and C. J. Hook. Space 88½.

American Kron Scale Company, Chicago.—Kron dial freight house scale. Represented by E. Ohnell, W. W. Camp, C. F. Larson, J. Kirk Rowell, E. M. Abramson, J. Sykes, F. M. Franklin, J. Bjornson and John Kelly. Space 125.

American Malleable Castings Association, Cleveland, Ohio.—Malleable iron castings with machines for demonstrating the twisting test and tensile strength. Represented by S. H. Standish, J. S. Llewellyn, W. A. Draves, A. O. Buckius, Jr., G. A. Faitz, D. J. Maher and F. A. Kavanaugh. Spaces 221 and 222.

American Railway Bridges and Buildings Association, Chicago.—Represented by C. A. Lichty. Space 226.

Anchor Company, New York.—Efficiency rail anchor. Represented by T. B. Bowman, G. H. Chadwell and O. Metcalf. Space 192½.

American Railroad Signal Supervisory Association, Chicago.—Represented by R. R. Baker, C. Drake and H. R. Bills. Space 226.

American Steel & Wire Company, Chicago.—Right-of-way fencing; galvanized steel fence posts; steel gates; wire rope; rail bonds; electrical wires and cables; switching ropes; telephone wire; railroad spikes; nails; staples and tacks; barbed wire; concrete reinforcement; springs; screw stock; wire; pole steps. Represented by L. A. Dietrich, J. W. Meaker, A. W. Froude, M. A. Evans, J. W. Collins, J. F. Alexander, L. P. Shanahan and B. H. Ryder. Spaces 51½, 52, 70, 70½ and 71.

American Valve & Meter Company, Cincinnati, Ohio.—Poage water columns with telescopic spouts; Anderson economy switch stands; Anderson interlocking switch stands. Represented by J. T. McGarry, D. J. Higgins, F. C. Anderson and J. DePinal. Spaces 130, 131 and 132.

American Vulcanized Fibre Company, Wilmington, Del.—Vul-cot fibre for track insulation. Represented by C. C. Bell, H. C. Hackett, John Barron, Wm. Maxwell and H. M. Dexter. Space 126.

Armco Iron Culvert & Flume Manufacturers Association, Middletown, Ohio.—Represented by Fred Milhoan and G. W. Jenkins. Spaces 99 and 100.

Austin Company, Cleveland, Ohio.—Photographs and details of ten types of standard buildings and special railroad buildings. Represented by G. A. Bryant, W. L. Bailey, B. Hopkins, W. F. Chambers, P. W. Swern and E. M. Haas. Spaces 158 and 158½.

The Balkwill Manganese Crossing Company, Cleveland, Ohio.—Articulated cast manganese crossings. Represented by S. Balkwill. Space 115.

The Barrett Company, New York.—Barrett's specification roofs and waterproofing; Tar Rok sub floors; Everlastic shingles and prepared roofings; Elastigum plastic cement; Nox Aer Leek boiler covering; semaphore roofing; Holt roof connections; Tarvia and paving pitch filler; Carbosota grade one liquid creosote oil. Represented by W. S. Babcock, C. T. Bilyea, John J. Ross, G. R. McVay, F. W. Freeman and K. C. Barth. Spaces 107½ and 108.

Benjamin Electric Manufacturing Company, Chicago.—Industrial lighting fixtures; water tight, steam tight, and vapor proof fixtures; electrical lighting specialties; water tight, weather proof conduit fittings. Represented by C. B. Harlow, G. B. Weber, A. E. Lubeck, O. L. Johnson and W. J. Goodrich. Spaces 157 and 157½.

Bethlehem Steel Company, Bethlehem, Pa.—New Century switch stands; Steelton positive switch stand; U. S. Army and Navy standard switch stand for heavy and light rails; switch stands. Represented by E. S. Knisely, R. W. Gillespie, N. E. Salsick, R. E. Belknap, G. S. Vickery and John F. Hennessy. Spaces 199 and 216.

Blaw-Knox Company, Pittsburgh, Pa.—Models of Clamshell buckets and steel forms for concrete construction; concrete mixers; plate and structural steel work; water cooling devices for open hearth furnaces. Represented by R. L. Grannis, R. B. Randall and O. B. Pulis. Space 170.

Boss Nut Company, Chicago.—Boss lock nuts. Represented by J. A. MacLean, J. W. Fogg and W. G. Willcoxson. Spaces 1 and 2.

Bryant Zinc Company, Chicago.—Highway crossing signals; batteries; bells; relays; signal accessories. Represented by Stanley C. Bryant, Jerre P. Costigan, Jno. Hensel and Theodore Cole. Spaces 154 and 155.

The Buda Company, Chicago.—Electric industrial trucks; "Hyduty" Paulus track drill; Buda-Wilson bonding drill, with Liberty clamp; car replacers; journal jack; Liberty tool grinder; switch stand; electric gate post; motor section cars; motor velocipedes; inspection car; ratchet jack; bumping post. Represented by J. L. Artmaier, H. C. Beebe, A. L. Bliss, Vaughan Y. Bell, G. E. Bryar, C. H. Bull, E. Conant, W. C. Dyer, M. A. Evans, R. B. Fisher, J. J. Gard, L. R. Griffin, H. J. Harkless, W. F. Hebard, G. W. Hoover, W. P. Hunt, Jr., H. L. Miller, P. G. Pendorf, F. E. Place, M. A. Ross, F. C. Tams, E. A. Thiele and L. M. Viles. Spaces 61, 62, 63, 64 and 65.

The Burden Iron Company, Troy, N. Y.—Staybolt iron; engine bolt iron; iron boiler rivets. Represented by John C. Kuhns. Space 10.

Camp Culvert Form Company, Denver, Colo.—Steel form for culvert construction. Represented by E. M. Camp. Space 225.

Carbic Manufacturing Company, Chicago.—Carbic cakes; portable acetylene lights; generators, oxy-acetylene cutting and welding equipment. Represented by D. C. Duncan, G. B. Van Buren and T. J. Hegland. Space 185.

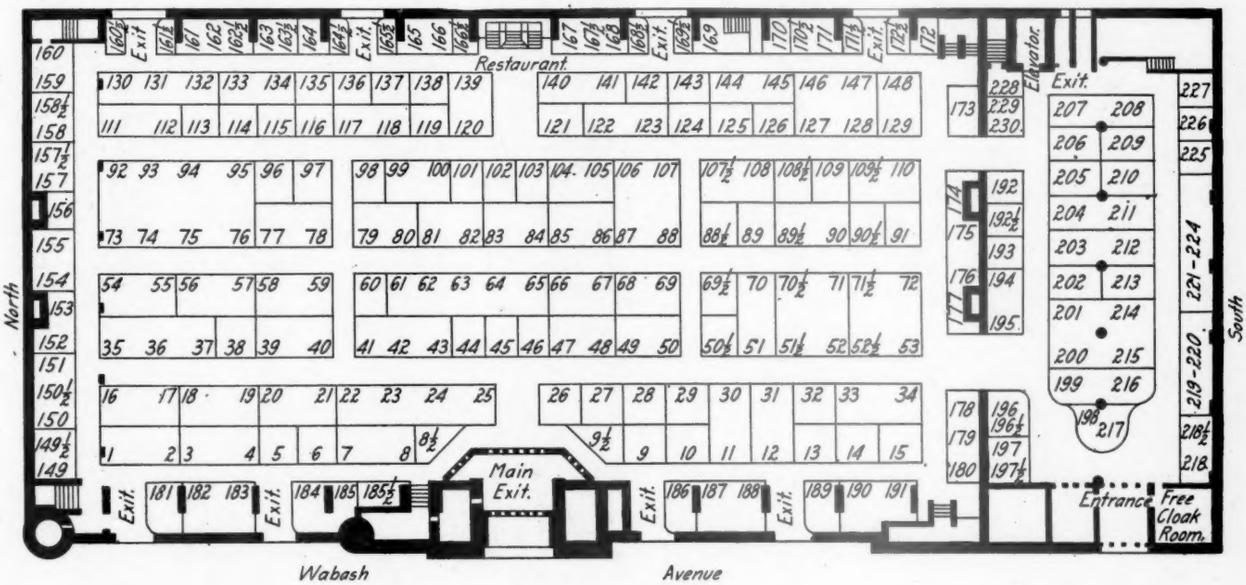
Carnegie Steel Company, Pittsburgh, Pa.—36-in. passenger train car wheel; 36-in. engine truck wheel with large diameter of sprinkling train. Represented by R. N. Chipman and E. D. Jackson. Space 135.

Clark Car Company, Pittsburgh, Pa.—Pictures and literature covering the Clark extension side dump cars. Represented by H. E. Chilcoat and H. G. Doran. Spaces 163 and 163½.

Cleveland Railway Supply Company, Cleveland, Ohio.—Switch stands; guard rails; "Safety" foot guards for guard rails and switches; malleable tie plates; flangeway guards for highway crossings and station platforms; automatic industrial track couplers. Represented by F. A. Peck, J. S. Peck and E. G. Deucher. Spaces 207 and 208.

Crerar, Adams & Company, Chicago.—Calumet track drills; Calumet die starter; shovels; jacks; Hercules and Standard trucks; waste; hammers; railbenders; chain blocks. Represented by J. Arthur Martin, G. D. Bassett, W. I. Clock, C. W. Gregory, R. M. Bullard, E. C. Poehler and W. L. Reidell. Space 28.

Detroit Graphite Company, Detroit, Mich.—"Superior Graphite Paint" for structural iron; "Sta-white" for storehouse interiors, freight car paint. Represented by T. R. Wyles, L. D. Mitchell, W. C. Bradford, A. H. Kuerst, H. I. Miller, L. F. McFarland, W. D. Waugh, J. J. Hogan and Capt. A. B. Edge. Space 108½.



Floor Plan of the Coliseum

hub; rolled steel piston blanks and piston center blanks; gear blanks for cranes and other shop uses; steel cross ties; splice bars; Braddock joints; electrical tool steels. Represented by N. M. Hench, Samuel Fray, E. S. Mills, C. B. Friday, H. Van Zandt and G. W. Landrus. Spaces 52½, 53, 71½ and 72.

Cast Iron Pipe Association, New York.—Cast iron pipe. Represented by R. C. McWane, F. E. Hutchins and J. F. McClure. Space 200.

Chicago Bridge & Iron Works, Chicago.—Model steel tanks. Represented by Merle J. Trees, George T. Horton, H. B. Horton, H. B. Murphey, K. I. Small, F. L. Cook, H. C. Brown, C. M. Ladd, C. H. Scheman, L. McDonald, R. C. Campbell, S. A. Poyer, F. E. Lee, W. R. Manock and O. A. Bailey. Spaces 51 and 70.

The Chicago Flag and Decorating Company, Chicago.—Bunting signal flags; U. S. and foreign flags; tourist luncheon equipment. Represented by Geo. L. Glendon, Walter Glendon, Thos. Glendon, J. McArdle, L. G. Magnusson and L. C. Bergeron. Spaces 187 and 188.

Chicago Malleable Castings Company, Chicago.—Thomas rail anchor tie plates. Represented by J. S. Llewellyn and W. M. Osborn. Space 142.

Chicago Railway Signal & Supply Company, Chicago.—Mechanical and electrical railway signaling devices. Rrepresented by E. W. Vogel, E. K. Brashears, A. C. Dunne, W. C. Martin, Carl Suhr, C. R. Ahrens, D. J. McCarthy, Wm. C. McClintock and W. H. Dayton. Spaces 77 and 78.

Chipman Chemical Engineering Company, Inc., New York.—Atlas "A" method of killing track vegetation, including method

Deeming-Endsley Company, Chicago.—Morrison switch-point hold-down. Represented by Herbert Deeming, Horace F. Endsley and P. O. Morrison. Space 184.

Diamond State Fibre Company, Chicago.—Rail insulation; fibre receptacles. Represented by Theo. Herbert, C. N. Reeves, H. P. Wilson and J. Esch. Space 13.

Paul Dickinson, Inc., Chicago.—Smoke jacks; ventilators and chimneys for engine house, shops, and small buildings. Represented by A. J. Filkins, E. B. Filkins, M. Carney and H. Knutson. Space 98.

The Duff Manufacturing Company, Pittsburgh, Pa.—Lifting jacks; high speed ball bearing for car and locomotive work. Represented by T. A. McGinley, E. A. Johnson, C. A. Methfessel and C. N. Thulin. Space 91.

Edison, Inc., Thos. A., Bloomfield, N. J.—Models of 1918 batteries; switchboard illustrating various methods of lighting automatic signals. Represented by L. W. McChesney, F. J. Lepreau, A. J. Loughern, I. P. Rodman, P. A. Garrity, E. A. Brown, E. W. Newcomb, O. P. Rose, R. I. Frost, B. F. Hines and Mr. Constable. Spaces 18 and 19.

Edison Storage Battery Company, Orange, N. J.—Edison alkaline storage batteries. Represented by H. G. Thompson, F. V. McGuiness and E. T. Sawyer. Space 636.

Electric Storage Battery Company, Philadelphia, Pa.—Chloride accumulator; "Ironclad" and "Exide" batteries for car lighting; interlocking and signal service; batteries used by Government during the war. Represented by G. H. Atkin, J. Lester Woodbridge, T. Milton, H. M. Beck, W. E. Dunn, W. Heritage and H. E. Hunt. Space 60.

Equipment Corporation of America, Chicago.—"Shop mule" industrial gasoline tractor. Represented by W. F. Hebard, B. C. Hooper, C. H. Conrad, A. C. Sloss, H. D. Gumpper, H. T. Rich, A. D. Moseby, H. M. Capron and L. F. Mead. Space 164½.

The Eymon Crossing Company, Marion, Ohio.—Continuous rail manganese crossing. Represented by Byron E. Wilson and James H. Eymon. Space 169½.

Fairbanks, Morse & Company, Chicago.—Oil engine, centrifugal pumps, steam pumps; motor cars; locomotive water crane; electric motors, generators and scales. Represented by L. H. Matthews, E. C. Golladay, D. K. Lee, F. J. Lee, C. B. Skelton, B. S. Spalding, F. M. Condit, W. F. Singer, A. A. Taylor, S. Smith, F. P. Drinker, J. F. Flanagan, H. E. Vogel, E. J. Coverdale, O. Tharle, C. W. E. Witter, G. J. Akers, F. M. Gardner, K. Jurgensen, G. Howard, E. Lang, C. H. Wilson, H. G. Balke, E. E. Pendray, H. E. Vergosen, J. D. Daggett, M. J. Kochendorfer, J. W. Ferguson and F. A. Moseley. Spaces 73, 74, 75, 76, 92, 93, 94 and 95.

The Fairbanks Company, Chicago.—Fairbanks trucks and barrows; Fairbanks valves; Star engine lathes; Louden overhead carrier system; electro magnetic portable drills, hammers and Canton crane. Represented by N. Lansing De Long. Spaces 196 and 196½.

Fairmont Gas Engine & Railway Motor Car Company, Fairmont, Minn.—Featherweight inspection cars; standard section motor cars; motor car outfits. Represented by Harold E. Wade, W. F. Kasper, Ward G. Day, R. J. Sawyer, R. B. Ballard, C. S. White and H. D. Fitz. Spaces 41, 42 and 43.

Federal Signal Company, Albany, N. Y.—Represented by Paul Renshaw, Carl Henze, M. R. Briney, H. C. Ware, C. N. Beckner, W. H. Reichard and S. J. Turreff. Spaces 47 and 48.

Federal Sign System (Electric), Chicago.—Federal Safety First electric railroad lantern; Federal electric siren; Federal electric renewable fuse. Represented by F. T. Baird, O. S. Burke and F. J. Ffrench. Space 228.

H. K. Ferguson Company, Cleveland, Ohio.—Represented by H. K. Ferguson, A. J. Hollingshead, H. S. Jacoby, O. C. F. Randolph and J. M. Taylor. Spaces 152 and 153.

The Frictionless Rail, Boston, Mass.—Frictionless rail for track curves. Represented by F. A. Barbey, S. W. Simonds, T. F. Dwyer, Jr., and J. T. Chamberlain. Spaces 133 and 134.

General Electric Company, Schenectady, N. Y.—Turbo-generator headlight sets; battery charging sets; switchboards; resistance units; lantern slides and photographs of installations of electrical equipments; lead burning transformer. Represented by John Roberts, H. W. Stewart, H. M. Jacobs, W. H. Sigourney, C. Dorticos, A. P. Jenks, A. J. Francis and L. W. Shugg. Spaces 35, 36 and 37.

The General Railway Signal Company, Rochester, N. Y.—Represented by F. L. Dodgson, W. S. Henry, W. K. Howe, H. W. Lucia, L. Thomas, J. R. Wills, M. Wuerpel and W. R. Young. Spaces 45 and 50.

Gilbert & Barker Manufacturing Company, Springfield, Mass.—Combination pump and tank oil storage outfits. Battery "T 29" back geared lubrication outfit; "T 31" cabinet lubricating tanks; "T 6" gallon stroke lubricating pump. Represented by J. E. Ham and J. R. Field. Space 169.

Gould Storage Battery Company, New York.—Full sized submarine battery; 40 ampere hour R. S. A.; 400 ampere hour R. S. A.; plates; separators. Represented by T. Entz, T. O. Moriarty and G. Berger. Spaces 149 and 149½.

Wm. Graver Tank Works, Chicago.—Model of Graver type "K" water softener; water filters; steel, oil and water storage tanks; general steel plate work construction. Represented by W. R. Toppan, W. C. Curd and J. J. Felsecker. Spaces 144 and 145.

Grip Nut Company, Chicago.—Grip nuts. Represented by W. E. Sharp, B. H. Forsyth, H. E. Passmore, Albert Roberts, J. E. Weatherford, H. J. Tierney and C. J. Wymer. Spaces 190 and 191.

W. & L. E. Gurley, Troy, N. Y.—Engineering and surveying instruments; Gurley precise transits with patented one-piece truss standard. Represented by H. M. Dibert and Malcolm Butement. Space 69½.

Hall Switch & Signal Company, Garwood, N. J.—Reception booth. Represented by W. J. Gillingham, H. W. Wolf, J. A. Ritter, H. L. Hollister, C. J. Harvig, D. R. Day and O. B. Frink. Spaces 85 and 86.

The Hatfield Rail Joint Manufacturing Company, Macon, Ga.—Hatfield rail joints and Hatfield rail joint fastenings. Represented by Walter T. Johnson and U. R. Hatfield. Space 166½.

Hayes Track Appliance Company, Richmond, Ind.—Hayes derails. Represented by S. W. Hayes, R. W. Slautterback, W. Harding Davis, Arthur Gemunder, E. L. Ruby, F. C. Stowell, C. S. Driffill, R. H. Gausepohl, P. I. Harris, R. S. Carson and O. M. Kendall. Spaces 140 and 141.

Hazard Manufacturing Company, Wilkes-Barre, Pa.—Rubber insulated signal wires and cables; lead encased wires and cables; steel tape armored cables; circular loom cables; wire rope; galvanized strand. Represented by A. W. Gabriel, Geo. P. Cady, Leroy W. Allen, H. B. Pflasterer, Thomas A. Keefe and Carl P. Brodhun. Spaces 3 and 4.

Hegeman-Castle Corporation, Chicago.—Clapp fire resisting paint; C. & C. electric welders; Anglo-American target enamel; tool steel gears and pinions. Represented by Chas. H. McCormick. Space 137.

Hubbard & Company, Pittsburgh, Pa.—Track tools and shovels. Represented by O. W. Youngquist, J. V. Smith and W. H. Remmel. Space 143.

Ingersoll-Rand Company, New York.—"Imperial" pneumatic tie tampers; portable compressor cars; pneumatic spike-driving hammer; screw spike drivers; portable pneumatic emery grinders; wood borers and drills for rail bonding. Represented by W. H. Armstrong, Charles Dougherty, C. W. Melcher and J. N. Thorpe. Space 206.

International Steel Tie Company, Cleveland, Ohio.—Steel twin ties for paved street track; steel crossing foundations and international paving guards. Represented by Wm. P. Day, W. C. Mahon, T. J. Lavan, V. E. Heglaw and W. S. Godwin. Space 189.

International Marine Welding Company, New York.—Roller lock nut. Represented by Cortlandt F. Ames and W. Craig Stone. Spaces 171½ and 172½.

H. W. Johns-Manville Company, New York.—Asbestos roofing; asbestos shingles; asbestos smoke jacks; pipe and boiler insulation. Represented by J. E. Meek, J. C. Younglove, G. A. Nicol, P. C. Jacobs, P. R. Austin, J. M. Borrowdale, H. M. Butters, H. Flannagan, D. L. Jennings, W. H. Lawrence, C. E. Murphy, H. G. Newman, J. H. Trent and E. H. Willard. Spaces 174, 175, 176 and 177.

O. F. Jordan Company, East Chicago, Ind.—Jordan spreader and ditching attachment. Represented by Walter J. Riley, Robert E. Bressler and Joseph A. Adley. Spaces 56 and 57.

The Joyce-Gridland Company, Dayton, Ohio.—Railroad jacks. Represented by Chas. D. Derby. Space 27.

Kalamazoo Railway Supply Company, Kalamazoo, Mich.—Hand, push and velocipede cars, motor cars, track drills, valve grinders, gauges, levels; railway appliances. Represented by Jno. McKinnon. Spaces 22, 23, 24 and 25.

Kaustine Company, Inc., Buffalo, N. Y.—Kaustine waterless toilets. Represented by G. W. Hambrook, F. B. Shalters and David A. Evans. Space 29.

Kelly-Derby Company, Inc., Chicago.—Ten H. P. oil-burning engine; Kaustine waterless chemical toilets; warehouse trucks; cast iron and semi-steel wheels. Represented by F. W. Adams, H. L. Bachman, W. H. Day, O. K. Fischer, W. B. Holcomb, C. W. Kelly and F. G. Koehler. Spaces 11 and 30.

The Kerite Insulated Wire & Cable Company, Inc., New York.—Insulated wire and cables. Represented by R. D. Brixey, Azel Ames, J. W. Young, P. W. Miller, J. A. Renton, C. R. R. Harris, B. L. Winchell, Jr., G. A. Graber, W. H. Fenley and J. A. Hamilton. Spaces 68 and 69.

Keystone Grinder & Manufacturing Company, Pittsburgh, Pa.—Railroad tool grinders. Represented by S. S. Newman and J. S. Wincrantz. Space 193.

The Kilbourne & Jacobs Manufacturing Company, Columbus, Ohio.—"K. & J." automatic air dump car. Represented by J. S. Mossgrove and David Greene. Space 97.

Knickerbocker Roofing & Paving Company, Chicago.—Standard bridge water-proofing; pitch and felt roofing for railroads. Represented by Mark A. Cronin and Geo. W. Pulford. Space 183.

Lackawanna Steel Company, Buffalo, N. Y.—Sections cases; rail joints; splice bars, hook shoulder tie plates; Abbott rail joint plates and safety head angle bars. Represented by A. P. Van Schaick, J. L. Hench, G. O. Benson and F. E. Abbott. Spaces 33 and 34.

The Lehon Company, Chicago.—Membranes for reinforcing concrete waterproofing; composition roll roofing and asphalt shingles; mastic floors, waterproof insulating fabrics and papers for refrigerator cars; plastic car roofing; canvas coach and caboose roofing. Represented by Tom Lehon, D. B. Wright, Chas. V. Eades and Edward Leonard. Space 109.

Lipman Refrigerator Car & Manufacturing Company, Beloit, Wis.—Refrigerator compressors; special refrigerating equipment for railway cars. Represented by C. E. L. Lipman, E. Lipman and T. E. Lipman. Space 116.

Chas. R. Long, Jr., Company, Louisville, Ky.—Paint films; sample panels, sample plates. Represented by Chas. R. Long, Jr.,

Harry Visserin, G. S. Turner, M. E. Keig, W. H. Heckman and Samuel W. Russell. Space 90½.

John Lundie, New York.—Lundie tie plates, Represented by C. Z. Moore and John Lundie. Space 165½.

The Lufkin Rule Company, Saginaw, Mich.—Measuring tapes; rules. Represented by S. B. McGee, Frank G. Brown and Fred Hollingworth. Space 121.

Macomber & White Rope Company, Kenosha, Wis.—Wire ropes for all railroad use. Represented by R. E. Jacobs, E. E. Roibirds and J. Boope. Spaces 89½ and 90.

M. W. Supply Company, Philadelphia, Pa.—Vaughan switch heaters; Vaughan rail benders; Vaughan guard rail clamps; Anchor guard rail clamps; tie plate guard rail fasteners. Represented by David L. Vaughan and Chas. Z. Vaughan. Space 101.

MacRae's Blue Book Company, Chicago.—MacRae's Blue Book. Represented by Albert MacRae, T. H. MacRae, Lloyd Simonson, L. R. Rollins, E. B. Cooks, C. H. Hill, R. S. Lundy, Alex Smith, W. F. Miller and J. A. Walsh. Space 9½.

The Madden Company, Chicago.—Three men rail laying machine; derrick truck car; "Red Top" steel fence post; Richter blue flag derail; Blair tie spaces; Harris-Muff ballast screen; Wagner switch point straightener; Veerac motor car; Perfect rail brace. Represented by Wallace W. Glosser, R. V. Dawney and H. C. Holloway. Spaces 194 and 195.

Marsh & Truman Lumber Company, Chicago.—Bloxonend flooring. Represented by F. L. Bronez, C. J. Carter, I. R. Garretson, A. B. McHenry, Mr. Mellier and M. G. Truman. Space 213.

Massey Concrete Products Corporation, Chicago.—Reinforced concrete products. Represented by C. F. Massey, F. V. Shannon, Lee Frank, J. E. Moody, R. G. Eliel, E. C. Alexander, Paul Kircher, Charles Gilman, J. E. Higgs, Jr., W. I. Creese, P. E. Longstreet and H. E. Burns. Spaces 54 and 55.

McGraw-Hill Company, New York.—Technical publications. Represented by Wm. Buxman. Space 8½.

Mercury Manufacturing Company, Chicago.—Electric storage battery tractors. Spaces 117 and 118.

Metal Hose & Tubing Company, Brooklyn, N. Y.—Gasoline, oil and paint spray hose and connections. Represented by J. M. Oden, R. S. Westcott, P. L. Tolerton, R. Berkowitz and U. J. Edwards. Space 96.

Metal and Thermit Corporation, New York.—Welded samples of rails and heavy sections; pipe welding by thermit process; carbon free alloys produced by thermit process. Represented by Henry S. Mann, C. D. Young, W. H. Moore and T. B. Skilton. Space 185½.

Miller Train Control Corporation, Danville, Ill.—Full size train-control equipment in operation. Represented by W. B. Murray, H. B. Miller, J. N. Garber and P. E. Herren. Spaces 197 and 197½.

Monroe Calculating Machine Company, Chicago.—Monroe calculating machines. Represented by Henry H. Doty, R. W. Peck, Jerome Kennedy, T. D. McElhiney and R. U. Preble. Space 9.

Mudge & Company, Chicago.—Mudge motor cars. Represented by Burton Mudge, Robert D. Sinclair, Karl J. Eklund, Jean K. Vanatta, Karl H. Leedom, Clyde P. Benning, Lloyd O. Stratton, Charles M. Mudge, George W. Bender, Loren Buchanan, W. J. Behlke, Jr., V. Pagett, Sherman C. Amsden, Fay E. Posson, Arthur L. Pearson, Albert C. Force and William B. Ross. Spaces 127, 128, 146 and 147.

National Carbon Company, Inc., Cleveland, Ohio.—Columbia track batteries; Columbia R. S. A. signal batteries; Columbia storage batteries; Columbia dry batteries; Hot Shot batteries; carbon brushes; lighting, moving picture and photographic carbons; welding and searchlight carbons; Columbia flashlights and flashlight batteries; carbon telephone specialties and special forms in carbons. Represented by Chas. S. Pflasterer, W. H. Arkenburgh, J. M. Spangler, W. R. Pflasterer, A. E. Pratt, R. J. Cox, W. G. Waitt, R. W. Erwin, C. W. Wilkins, L. W. Fischer and Wallace O'Connor. Spaces 150, 150½ and 151.

National Concrete Machinery Company, Madison, Wis.—Concrete posts, molds, reinforcements and signal signs; The Toohey timber dapper. Represented by S. T. Walker, Victor Rogers and A. H. Anderson. Space 164.

National Lead Company, New York.—Dutch Boy red-lead; Dutch Boy white-lead. Represented by F. M. Hartley, Jr., and Chas. B. Field. Space 113.

The National Lock Washer Company, Newark, N. J.—Lock washers and Hipower nut locks. Represented by C. H. Loutrel, F. B. Archibald, J. H. Horn, A. T. Thompson and R. L. Cairncross. Space 192.

The National Malleable Castings Company, Cleveland, Ohio.—Track devices. Represented by T. W. Aishton. Space 102.

National Surface Guard Company, Chicago.—Tie tongs; combination tie and rail tongs; rail saws; cattle guards. Represented by C. C. Zimmerman and H. A. Smith. Space 210.

Nichols & Bros., Geo. P., Chicago.—Gas engine power plant for turntable tractor; electric tractor; transfer table model; two electric collector devices; air motor. Represented by Geo. P. Nichols, S. F. Nichols, R. M. Gaston and N. Fries. Space 173.

North American Engine Company, Algona, Iowa.—Section motor cars and engines. Represented by E. A. Adams, C. W. Nicoulin, C. H. Cretzmeyer, J. Edward Murphy and Mrs. C. H. Cretzmeyer. Spaces 170½ and 171.

Ogle Construction Company, Chicago.—Models, photographs and designs of locomotive coaling stations and coal handling machinery. Represented by R. A. Ogle, C. F. Bledsoe and M. W. Powell. Spaces 12 and 31.

The Okonite Company, New York.—Rubber-covered wires and cables. Represented by H. Durant Cheever, J. V. Underhill, F. J. White, W. R. Van Steenburgh, H. A. Hamilton, Charles A. Miller and J. W. Hackett. Spaces 16 and 17.

O'Malley-Beare Valve Company, Chicago.—Globe, angle and check valves; medium and extra heavy; special valves; Duplex blow-off cocks; Perfection gauge cocks. Represented by Edward O'Malley, Thomas O'Malley, J. N. Gallagher, J. E. Brown, J. M. Pigott, W. H. Morris, F. A. Hitesman. Space 114.

The P. and M. Company, Chicago.—P. & M., Vaughan, Henggi, Ajax rail anti-creepers; bond wirep rotectors. Represented by F. A. Poor, P. W. Moore, Fred A. Preston, F. N. Baylies, D. T. Hallberg, S. M. Clancey, George C. Clifford, J. D. Griswold, P. H. Hamilton, George E. Johnson, J. E. Mahoney, John Reagan, W. H. Reaves, John Ritchie, P. V. Samuelson, L. S. Walker and William A. Maxwell. Spaces 122 and 123.

Page Steel & Wire Company, New York.—Armco iron bond wires; "Copperweld" bond wires; Armco iron and "Copperweld" wire, single and strand, for electrical transmission; Armco iron welding wire. Represented by W. T. Kyle and C. A. McCune. Spaces 81 and 82.

Pittsburgh-Des Moines Steel Company, Pittsburgh, Pa.—Steel railway service tanks; railway bridges; signal bridges. Represented by Max Whitacre, W. W. Hendrix, M. P. Cogswell, E. J. Mershon, W. R. Workman, J. E. O'Leary, H. W. Ford, W. A. DaLee, C. L. Todd, A. C. Pearsall, Herbert Miller. Spaces 83 and 84.

The Pocket List of Railroad Officials, New York.—The Pocket List of Railroad Officials. Represented by J. Alexander Brown, Harold A. Brown and Charles L. Dinsmore. Space 26.

Positive Rail Anchor Company, Marion, Ind.—Rail anchors; guard rail; braces and plates; tie plates; rail braces; combination tie plates and rail braces. Represented by A. H. Told, J. A. Shoulty, L. C. Ferguson, E. A. LeBeau, W. H. Davis and C. H. Webb. Spaces 178, 179 and 180.

The Protective Signal Manufacturing Company, Denver, Colo.—Highway crossing and electric signaling equipment. Represented by Will C. Neahr, Raymond Ramage and Walter E. Wegner. Spaces 165 and 166.

Pyrene Manufacturing Company, New York.—Hand chemical fire extinguishers; hand drawn chemical fire engines; fire protection and prevention supplies. Represented by R. G. Henderson, B. K. Cosby, H. M. McCullen, R. M. La Barr, W. L. Krause, C. I. McCarthy, R. C. Houghton and Jirah D. Cole. Space 186.

The Q & C Company, New York.—Bonzano joints; rolled steel step joints; derails; replacers and clamps; rail benders; guard rail clamps. Represented by J. V. Westcott, E. M. Smith, F. F. Kister, E. R. Packer, C. M. Brennan, R. J. McComb and C. F. Quincy. Spaces 120 and 139.

The Rail Joint Company, New York.—Continuous standard, insulated and step joints; Weber standard and insulated joints; 100% joints. Represented by V. C. Armstrong, W. P. Thomson, B. G. Braine, J. A. Greer, R. W. Payne, McLeod Thomson, R. R. Seward, E. F. Schermerhron, E. L. Van Dresar, F. C. Webb, E. A. Condit, Jr., W. S. Boyce, J. N. Meade, H. C. Hickey, Chas. Jenkinson, R. W. Smith, C. B. Griffin, J. H. Larson, Alex. Chapman, J. C. Barr and J. G. Miller. Spaces 79 and 80.

Railway Review, Chicago.—Railway publications. Represented by Willard A. Smith, Harold A. Smith, W. M. Camp, C. W. Parks, J. E. Gougeon, C. L. Bates and L. H. Lozier. Space 44.

The Railroad Supply Company, Chicago.—Tie plates; derailers; wig wag signals; relays; crossing bells; lightning arresters; annunciators; channel pins; electric measuring instruments; crossing gates; relay boxes; time relay; ground plates; terminals; cable posts; connectors. Represented by E. H. Bell, Paul W. Kohnen, H. M. Buck, M. J. Fox, R. S. Prentice, H. G. Van Nostrand, F. M. Hill, A. H. Smith, W. C. Irwin, Geo. T. Cook, F. C. Webb, Geo. M. Kenyon and R. D. Hawley. Spaces 104 and 105.

Ramapo Iron Works, Hillburn, N. Y.—Manganese switch points; switch stands; guard rail clamps; double shoulder solid

bottom switch riser plates. Represented by Thomas E. Akers, J. Edgar Davidson, Arthur Gemunder, W. C. Kidd, William Wait Snow and James B. Strong. Spaces 109½ and 110.

Reading Specialties Company, Reading, Pa.—Car and engine replacers; compromised rail joints; guard rail clamps; rail benders; derails; guard rails; rail straighteners; tie spacers; replacer clamps. Represented by B. J. Buell. Space 45.

Rice Manufacturing Company, Indianapolis, Ind.—Red Devil rivet cutter; Baby Devil rivet cutter. Represented by A. G. Rice, L. E. Miller and A. Ryder Dyer. Space 172.

Richards-Wilcox Manufacturing Company, Aurora, Ill.—"Overway" conveying systems; lift doors; door hangers; fire-door hardware; grindstones and hoists. Represented by J. V. Wise, J. H. Wise, A. J. Eggleston and E. J. G. Phillips. Spaces 159 and 160.

Rich Tool Company, Chicago.—High speed drills; reamers; countersinks; rivet sets. Represented by James L. Crowley. Space 182.

Roadmasters and Maintenance of Way Association of America, Sterling, Ill.—Represented by P. J. McAndrews. Space 227.

Rogers' Journal Packing Company, Inc., Chicago.—Rogers' Stecos journal packing for locomotives, passenger and freight cars. Represented by E. C. Hall and C. A. Elsy. Space 156.

Roberts and Schaefer Company, Chicago.—Photographs of reinforced concrete locomotive coaling plants; "RandS" gravity sand plants and cinder handling plants for railroads. Represented by Clyde P. Ross, M. V. Bailliere, C. C. Brackett and H. S. Shimizu. Space 89.

Safe Lock Switch Machine Company, Lexington, Ky.—Safe Lock switch machine. Represented by C. Daugherty, D. M. Case, C. F. Jones and Leo Jones. Space 168½.

Sellers Manufacturing Company, Chicago.—Sellers anchor bottom wrought iron tie plates. Represented by J. M. Sellers, G. M. Hogan, R. A. Van Houten, T. D. Crowley and R. J. Platt. Space 124.

Signal Accessories Company, New York.—Signal material. Represented by F. C. Lavarack and C. R. Ahrens. Space 119.

Simmons-Boardman Publishing Company, New York and Chicago.—Railway Age; Railway Maintenance Engineer; Railway Signal Engineer; Railway Mechanical Engineer; Railway Electrical Engineer. Represented by E. A. Simmons, L. B. Sherman, Henry Lee, C. R. Mills, F. S. Dinsmore, H. H. Simmons, H. H. Marsh, J. M. Rutherford, R. H. Smith, F. W. Lane, F. C. Koch, Samuel O. Dunn, R. V. Wright, E. T. Howson, W. S. Lacher, J. G. Little, A. F. Stuebing, K. E. Kellenberger, B. W. Meisel, H. Parkes, N. H. Crossland and T. E. Crossman. Space 46.

Southern Pine Association, New Orleans, La.—Structural yellow pine of interest to engineers; methods of prolonging life of ties and piling by preservatives; rail fastenings; model of unit of railroad shop; model of creosoted pine water tank; model of timber span; model of highway bridge; moving pictures showing various phases of lumber manufacturing. Represented by Alfred L. Kammerer. Spaces 203 and 212.

T. W. Snow Construction Company, Chicago,—Railway water crane; railway oil crane; railway coal hoist. Represented by T. W. Snow and R. E. Gurley. Space 50½.

Squire Cogswell Company, Chicago.—Volkhardt valves and hydrants; Hauck thawing burners and oil burning equipment. Represented by Willis C. Squire and C. P. Cogswell. Space 161½.

Standard Asphalt and Refining Company, Chicago.—Sarco mineral rubber mastic floors; Sarco mineral rubber refrigerator compound; Sarco waterproofing; Sarco mineral rubber roofing materials; Sarco mineral rubber coatings. Represented by R. F. Trumbull, E. L. Hedrick, George A. Thornton, E. P. Shipley, Charles Muller, J. M. Woodruff, H. C. Riehle and C. L. Gauthier, Spaces 161, 162 and 162½.

The Stuebing Lift Truck Company, Chicago.—Lift trucks; platform systems. Represented by Albert O. Kraemer. Space 230.

Templeton, Kenly & Company, Ltd., Chicago.—Simplex track, ballast and bridge jacks; Simplex emergency jacks; Simplex pole pulling jacks; Simplex auto and truck jacks. Represented by W. B. Templeton, H. B. Burlow and A. C. Lewis. Space 32.

Track Specialties Company, Inc., New York.—Guard rail clamp; guard rail brace; compromise joint; switch plate and brace; anchor plate; rail joints; tie plate; rail brace; derailer; track shim bender. Represented by W. B. Lee. Space 205.

Train Control Appliance Company, El Paso, Tex.—Automatic train control. Represented by M. B. Bulla, H. S. Campbell and E. C. Monroe. Space 209.

Toledo Scale Company, Toledo, Ohio.—Scales; automatic portable; self-contained automatic dormant; section of 25 ton automobile scale. Represented by H. O. Hem, C. H. Hapgood and Geo. W. Bollinger. Space 136.

Torchweld Equipment Company, Chicago.—Welding and cutting apparatus; oxy-acetylene regulators; welding torches; cutting torches. Represented by C. J. Nyquist, W. A. Slack, H. R. Fenstemaker, W. L. Sehnert and N. Robel. Space 181.

Underwood Typewriter Company, New York.—Bookkeeping and billing machines. Represented by F. A. Robinson and F. W. Blake. Spaces 200, 201, 214 and 215.

Union Switch & Signal Company, Swissvale, Pa.—Represented by A. L. Humphrey, G. A. Blackmore, L. F. Howard, W. P. Neubert, J. P. Coleman, J. E. Saunders, C. O. Harrington, H. A. Wallace, J. F. Talbert, W. P. Allen, Aaron Dean, H. W. Griffin, J. J. Cozzens, J. L. Brastow, J. S. Hobson, W. W. Talbert, S. E. Gillespie, V. K. Spicer, J. L. Loucks, Geo. Marloff, J. D. Roett and H. R. Sheene. Spaces 66 and 67.

U. S. Wind Engine & Pump Company, Batavia, Ill.—Railway water columns; pumps; tanks; watering devices for locomotives; spouts; valves; switch stands. Represented by L. E. Wolcott, C. E. Ward, James P. Prindle, E. B. La Salle and F. E. Pearson. Spaces 111 and 112.

United States Switch Company, Eau Claire, Wis.—Automatic railway switch lock. Represented by J. W. Hubbard. Space 6.

Verona Tool Works, Pittsburgh, Pa.—Track tools; track jacks; levels; gauges; nut locks. Represented by H. S. Paul, E. Woodings, H. C. Mull and E. L. Ruby. Spaces 129 and 148.

Volkhardt Company, Inc., Stapleton, N. Y.—Railroad water hydrants. Represented by Wm. Volkhardt, Chas. P. Cogswell and W. C. Squire. Space 160½.

The Walls Frogless Switch & Manufacturing Company, Kansas City, Mo.—Complete railway frog. Represented by C. E. Ennis, J. J. Lutz, O. Leamon and J. J. Schimmel. Spaces 219, 219½ and 220.

The Waterbury Battery Company, Waterbury, Conn.—Waterbury unit cylinder primary batteries; Waterbury plate type primary batteries; Waterbury separate cylinder type primary batteries; Gordon primary batteries; Waterbury track batteries. Represented by E. E. Hudson, G. A. Nelson and S. T. Hough. Space 38.

Wayne Oil Tank and Pump Company, Fort Wayne, Ind.—Pumps for handling oils, gasoline, naphtha, lubricating oils and fuel oils; storage tanks; measuring devices and gauges. Represented by B. F. Geyer. Space 138.

West Coast Lumbermen's Association, Seattle, Wash.—Douglas fir, Sitka spruce, western hemlock and red cedar lumber. Represented by C. J. Hogue. Spaces 204 and 211.

Western Electric Company, Inc., New York.—Telephone train dispatching equipment; shop lights; electric drills and track tampers; incandescent lamps; storage battery power and light units; safety switch and steel towers; signal and code wires. Represented by John C. Binning, Geo. Hull Porter, G. K. Heyer, E. V. Adams, R. M. Campbell, A. L. Crater, W. O. Turtle, F. M. Evans, W. J. Davis, Jr., Geo. Sherry, T. J. Rider, G. E. Cullinan, Walter P. Hoagland, C. H. Wharton and L. A. Muttart. Spaces 58 and 59.

Woolery Machine Company, Minneapolis, Minn.—Railway motor car and engines for railway motor cars. Represented by H. E. Woolery. Space 5.

The Wyoming Shovel Works, Wyoming, Pa.—Shovels. Represented by G. E. Geer and H. C. Emery. Space 103.

Western Railway Club Meeting

W. S. Bartholomew, president of the Locomotive Stacker Company, Pittsburgh, Pa., made an illustrated address at the monthly meeting of the Western Railway Club last evening on the use of mechanical stokers in locomotives. He emphasized particularly the importance of the stoker in increasing the capacity of the locomotives and the advantages from an operating standpoint.

Lieutenant-Commander Dexter C. Buell of the United States Navy Bureau of Ordnance gave an illustrated address on the construction and use of the batteries of 14-in., 50-caliber naval rifles which were placed on railway mountings in such a way that they could be moved almost anywhere on the railways of France. These were assembled in record-breaking time and rendered good service at the front as early as last September. Lieutenant-Commander Buell is known to railway men as director of the Railway Educational Bureau at Omaha, Nebr.

Meeting of the American Association of Engineers

A Report of the Railroad Conference Held Yesterday in the Gold Room at the Congress Hotel

A RAILROAD CONFERENCE under the auspices of the American Association of Engineers was held yesterday in the Congress hotel. Primarily the conference was called to discuss means of promoting the social and economic welfare of the railroad technical engineer and to formulate principles for the direction of the railroad committee of the association. Both afternoon and evening sessions were held.

The discussion, in the afternoon, was begun by H. P. Gillette, editor Engineering Contracting, who spoke on, "Shall Engineers Be Paid Overtime?" Mr. Gillette was of the opinion that the designer or supervisor of important work never ought to hold himself or be held to a time unit as a basis for payment for services rendered. He doubted, however, if it was just to require men holding positions of semi-mental, semi-muscular duties, such as ordinary drafting or surveying, to be oblivious to the length of the working day in the hope of being rewarded by advancement to the supervisor class.

After calling attention to the fact that there is no logical dividing line between subordinates and supervisory positions a practical way of meeting the difficulty suggested was to use the highest wage or salary paid to union labor employes on the line as a standard. All technical engineers receiving more than the sum determined as above would then be placed in the supervisor class and receive no pay for overtime.

This discussion was followed by a paper entitled "Principles and Procedure in Classification and Salaries of Railroad Engineers," which was presented by J. L. Jacobs of the Curtis Publishing Company. He said in part:

Essential features and underlying principles for sound classification and salary standardization have been developed as a result of intensive studies, experiences and observations of employment situations in many services. These essentials and principles are set out as measuring standards for the classification and standardization of the railroad professional engineering positions as well as for other professional engineering groups.

As the plan proposed for the railroad professional engineers measures up to these standards so will the broad purposes be attained. The program of service and standardization of all the professional engineers should be the program of the railroad professional engineering group and that program should include the following 14 essentials:

(1) Equitable and logical basis for fixing and adjusting salaries in relation to duties and qualification requirements and cost and standard of living.

(2) Definite wage differentials for different positions based on special work and qualification requirements, location and other special employment conditions.

(3) Classification of positions into functional classes, all positions being placed into classes according to general character of duties and into grades according to responsibility and difficulty of work.

(4) Standard and distinctive titles for all positions having similar duties and work requirements.

(5) Definitions of duties and responsibilities for each position.

(6) Definitions of qualification requirements for each position.

(7) Definite and equitable plan for recognition of efficient service and seniority through periodic advancement—particularly applicable to the lower grade positions.

(8) Definite lines of promotion for employees in the various groups and grades.

(9) Definite regulations for the determination, adjustment and control of salaries and working conditions.

(10) Standards of service for use as a basis of advancement, transfer and increases based on efficient service and seniority.

(11) Basis for the establishment of co-operative relations and measures between employees and management to improve social, economic and industrial conditions.

(12) Definite plan of administrative machinery for insuring equitable and orderly handling of problems of classification, salaries, working conditions and other matters of mutual interest.

(13) Definite formation of effective and fully representative associations for studying, developing and advising on the industrial, economic and public matters which are of common interest to all and for mutual support.

(14) Definite proposals for the next steps in the improvement of the status of professional engineering and the development of positive methods and ideals for service and employment.

The following general procedure could be successfully applied in connection with the broad program of classification and salary standardization for railroad professional engineering positions as well as for the other professional engineering groups:

(1) Establish co-operative relations with representatives of professional engineering groups and associations, employers and governmental agencies, with a view of obtaining common understanding, full-hearted consideration and support in the development and establishment of the standardization program.

(2) Determine the divisions of professional engineering groups and the order in which classification and salary standardization for the same are to be developed.

(3) Collect for analysis, information and data from reports and documents containing laws, rules and regulations and descriptions of the organization, work and qualification requirements of the positions under consideration.

(4) Collect for analysis information and data on cost and standard of living, hours of work and other working conditions for the respective positions by districts and for the country as a whole.

(5) Develop groups of occupations setting forth standard and distinct title designations, definition of duties and qualification requirements; character of occupations, and lines of advancement and promotion.

(6) Establish factors and standards for the determination of basic salaries and differentials dependent on educational requirements, cost and standards of living, working conditions and special qualifications.

(7) Develop standards of service as a basis for selection, assignment, transfer and advancement according to service and seniority.

(8) Prepare code of regulations and conditions as part of the general standardization plan.

(9) Hold conferences with representative of engineering groups and employers with a view of obtaining suggestions as to changes in classification standards and factors, and approval of the general plan.

(10) Prepare regulations and procedure on the manner and method of applying and administering the standardization program.

Mr. Jacobs' paper was followed by an open discussion of the schedule of monthly salaries for technical engineers: In submitting the schedule the committee stated that it had proceeded on the basis of fixing minimum rates for tapemen, division engineers, and chief engineers, considering that these positions were basic. The fixing of the intermediate rates was then largely mechanical. Adjustments were made, however, to ensure that the rate fixed for a particular position was commensurate to that paid to men of similar rank in other departments.

Summarized, my views as to the three prime requisites to obtaining greater recognition for the engineering pro-

fession may be stated as follows: (1) Organization, (2) licensing, (3) broader education, interest and activity in other than purely technical matters.

The movement of the day appears to be in the direction of organization by classes, and the engineering profession ought to be, and I trust is, alive to the movement. Therefore, let us invite the co-operation of all and use our influence in every direction to build up a national association which will embrace all branches of the profession and have as its object not only the advancement of technical research, but the economic, social and political welfare of the profession as a whole.

W. W. K. Sparrow, corporate chief engineer of the Chicago, Milwaukee & St. Paul, presented a paper entitled, "How Shall Proper Recognition of the Engineering Profession Be Obtained?" He said in part:

While I understand the question most of us are perhaps most interested in at this time is the economic welfare of the engineer and how to secure more adequate compensation for his services, yet I feel that we should not confine our discussion or energies to this phase of the question only, but should also endeavor to secure greater application and recognition of the profession socially and politically and in the problems of reconstruction, with which not only this country, but the whole world is today confronted.

After citing several striking instances of this lack of recognition and some of the causes contributing to this condition, he continued:

During the day the following schedule of monthly salaries was adopted:

	Minimum salaries per annum, depending upon extent and importance of duties	
Chief Engineer	$15,000	$9,000
Assistant Chief Engineer	9,000	7,200
District Engineer	6,000	4,800
Assistant District Engineer	5,400	4,200
Division Engineer	4,800	4,200
Assistant Division Engineer	3,600	2,750
Resident Engineer, Chief Engineer or District Engineer	4,200	3,000
Office Engineer—Field Engineer	5,400	3,600
Engineer of Bridges	7,500	6,000
Assistant Engineer of Bridges	5,400	4,800
Signal Engineer	7,200	4,200
Assistant Signal Engineer	4,800	3,000
Building Engineer	6,000	3,000
Valuation Engineer	8,400	7,200
Assistant Valuation Engineer	6,000	4,800
Chief Pilot Engineer	4,800	3,600
Pilot Engineer	3,600	3,000
Engineer Accountant	3,600	3,000
General Superintendent of Motive Power	15,000	9,000
Assistant General Superintendent of Motive Power	9,000	7,200
Mechanical Engineer	7,500	6,000
Assistant Mechanical Engineer	4,800	3,600
Engineer of Tests	7,500	6,000
Electrical Engineer	6,000	4,800
District Electrical Engineer	3,600	2,700
Shop Engineer	4,800	3,600
Chief Draftsman	3,600	3,000

	Minimum salaries per month		
Leading Draftsman or Designer	200	to	250
Draftsman	150	to	200
Junior Draftsman	125	to	150
Tracer	100	to	120

	Minimum salaries per month		
Engineer Inspectors	150	to	225
Instrument Man	200	to	225
Rodman	125	to	150
Tapeman	100	to	120

New Signal Committee Chairman

The name of one new committee chairman appears upon this year's list of the standing committees of the A. R. A. Signal Division. Committee IV, Direct Current Automatic Block Signaling, is headed by C. F. Stoltz, signal engineer of the Cleveland, Cincinnati, Chicago & St. Louis. Under the direction of Mr. Stoltz, it will be the duty of this committee to prepare unit specifications for direct current motor operated signal mechanisms, including in such specifications the requirements for the maximum energy in watt-seconds to operate, and the minimum watts to hold the signal and minimum torque in lever arm foot pounds required to return the mechanism to the stop position with and without spectacle and blades. Instructions will also be prepared for making torque tests of electric motor signals, and unit specifications will be drawn up covering signals and their installation; rail bonding; wire lines; switch circuit controllers and resistance units.

C. F. Stoltz
New Committee Chairman, Signal Division

Mr. Stoltz became a member of the Railway Signal Association in 1913 and in 1914 he was appointed a member of Committee IV, on which he has served continuously to date. In 1918 he was appointed vice-chairman of the committee.

In 1916 he was appointed to Committee VII, Direct Current Relays, and has served continuously on this committee to date. As a member of Committee VII, Mr. Stoltz has helped in the preparation of unit specifications for direct current relays; standard relay resistance table and recommended minimum allowable drop away point for relays of resistances named in the standard resistance table. The outline of the work for 1919 covers the preparation of specifications for coils, cores, armatures, etc., on relays and provides for the interchangeability of the parts.

After Mr. Stoltz graduated from Miami University in 1906 he entered the service of the Cleveland, Cincinnati, Chicago & St. Louis as a draftsman and served in this capacity until 1910. He was then appointed assistant signal engineer for the Big Four, which position he held until November 20, 1913, when he was appointed signal engineer for the system, the position which he now holds.

The Amalgamation of the Railway Signal Association

Its Relation to the American Railroad Association and the Manner in Which Its Activities Will Be Affected

WHAT RELATION WILL THE Railway Signal Association bear to the American Railroad Association? Will its activities be curtailed or increased and what benefits will the members derive from the new arrangement? These are typical of many questions which are being asked by the members of the Railway Signal Association and indicate the wide difference of opinion which exists as to its future. Many members view with regret the loss of its indentity, and rightly so, as this reflects the enthusiasm and *esprit de corps* existing among them which has been the means of placing the association on the present high plane it occupies today.

A History of the Change in Status

In view of the above a brief history of the steps taken in the amalgamation plan may not be out of place at this time. The old Railway Signaling Club was founded on March 11, 1895, by George Basford, now president of the Locomotive Feed Water Heater Company of New York. At the March meeting of this organization in 1903, held in the Wayne hotel at Detroit, Mich., C. C. Rosenberg made the motion which resulted in changing the name of the Railway Signaling Club to the Railway Signal Association. At midnight on February 28, 1919, the affairs of the Railway Signal Association were terminated and the activities of the organization were transferred to the American Railroad Association. Thus there lacked but a few days of completing a period of 24 years of progress by the former association.

On January 28, 1918, the director general issued General Order No. 6 directing that carriers' operating revenues should not be expended for the payment of expenses of persons or agencies constituting associations of carriers unless such associations were approved in advance by the director general. The Railway Signal Association made application and received temporary approval for the use of funds already on hand to pay the current expenses of the association until April 30, 1918. The director general on April 26, 1918, approved the R. S. A. *until further orders,* and authorized the carriers to pay the necessary assessments needed for the current expenses of the association. On May 2, 1918, a conference of the presidents of some of the larger voluntary railroad organizations was held in New York on the call of Acting President Thompson of the American Railway Association, to comply with the suggestion of the director general that the several associations be amalgamated to form one congress of associations.

A meeting of the Board of Direction of the R. S. A. was next held at Chicago on May 9 and 10, 1918. In addition to the members of the Board of Direction, C. A. Christofferson, R. B. Elsworth, P. M. Gault, F. B. Patenall, J. A. Peabody, F. B. Wiegand, G. E. Ellis, A. R. Fugina, J. Leisenring, H. K. Lowry and B. H. Mann were present. A plan was outlined at this meeting which was later submitted to the joint conference of the several railroad organizations.

On January 10, 1919, the director general issued Circular No. 70 stating that during the period of Federal control and in order to provide a responsible channel through which the director general may obtain recommendations for the advancement of railroad practice, the American Railway Association has revised its articles of organization and by-laws and will change its name to the American Railroad Association. This association consists of five sections, viz.: operating, engineering, mechanical, traffic and transportation. Its scope was enlarged to cover the former activities of a number of the associations, including the Railway Signal Association. This association becomes the signal division of the Engineering section. Railroads under Federal control may become members of the American Railroad Association and are directed to be represented and participate in the activities of each section through their proper officers.

On February 24, 1919, the Board of Direction of the R. S. A. held a meeting at Chicago, to comply with Circular No. 70 and arranged that the R. S. A. will be known as the Signal division of the Engineering Section of the American Railroad Association as indicated in the following resolutions:

Resolved, That in pursuance of Article VII, Section 4, of the Railway Signal Association constitution, reading—"The Board of Direction shall manage the affairs of the association and shall have full power to control and regulate all matters not otherwise provided for in the constitution, except to make the association liable for debt to an amount greater than that which, at the time of contracting the same, shall be in the secretary-treasurer's hands in cash and not subject to prior liabilities."—the affairs of this association are transferred to the Signal division of the American Railroad Association.

Resolved, That in pursuance of Circular No. 70 of the Director General of Railroads of the United States, issued under date of January 10, 1919, the affairs of the Railway Signal Association, effective midnight, February 28, 1919, are hereby terminated and the activities of that organization transferred to the American Railroad Association.

The necessary details in connection with the transfer of the activities, funds and securities of the R. S. A. have been consummated by the Board of Direction and the interests of the R. S. A. properly safeguarded.

The Membership and Committee of Direction

The membership of the Signal division will consist of representative members and affiliated members. The representative members are appointed by their respective railroads and the affiliated members will consist of the former active, junior, associate, honorary and life members. All present memberships of the various classes as outlined above are transferred to the Signal division either as members, if they were representative members before, or as affiliated members. Future affiliated membrs may be appointed by the Committee of Direction. Each railroad affiliated member (the former active, other than those appointed as representative members, and junior members) will pay $3 per annum and other affiliated members (the former associate members) will pay $6 for such printed matter as may be provided by the Committee of Direction of the division.

The present organization provides for a chairman, two vice-chairmen, a secretary, a committee of direction and standing committees for the division. The chairman and vice-chairmen of the division will be elected annually by the section. The Committee of Direction will consist of 16 members, and its chairman and two vice-chairmen will be elected from among its members.

R. E. Trout, signal engineer of the St. Louis-San Francisco, was elected chairman of this committee, and C. J. Kelloway, superintendent of signals, Atlantic Coast Line, and F. W. Pfleging, signal engineer, Union Pacific, were elected the vice-chairmen. The other members on this committee are W. J. Eck, signal and electrical superintendent, Southern Railway; C. A. Dunham, signal engi-

neer, Great Northern; W. H. Elliott, signal engineer, New York Central, Lines East; A. H. Rice, signal engineer, Delaware & Hudson; J. H. Cormick, signal engineer, Canadian Northern; E. E. Worthing signal engineer, Southern Pacific Lines, Atlantic System; A. P. Hix, signal engineer, Terminal Railroad Association of St. Louis; E. G. Stradling, signal engineer, Chicago, Indianapolis & Louisville; G. E. Ellis, Division of Safety, Interstate Commerce Commission; H. K. Lowry, signal engineer, Chicago, Rock Island & Pacific; Barton Wheelwright, engineer maintenance of way, Grand Trunk New England Lines, and F. P. Patenall, signal engineer, Baltimore & Ohio.

The Committee of Direction will conduct the business of the division and it will be its duty to fix the number of and appoint the members to the committees that may be necessary to properly investigate and report on such subjects as may be assigned. It is proposed to hold regular meetings of the Committee of Direction in March, June and September, respectively, of each year, the date and place to be decided on by the chairman. These meetings will likely be held in advance of the stated meetings of the division. Special meetings may be held at the call of the chairman. The annual meeting of the division will be held in September of each year, the time and the place of meeting will be announced approximately three months in advance by the Committee of Direction.

The Standing Committees

For the present the standing committees of the division are as follows:

Committee on Committees
Committee on Annual Meetings
Committee on Editing
Committee on Mechanical Interlocking
Committee on Power Interlocking
Committee on Direct Current Automatic Block Signaling
Committee on Maintenance and Operation
Committee on Direct Current Relays
Committee on Standard Designs
Committee on Alternating Current Automatic Block Signaling
Committee on Wires and Cables
Committee on Signaling Practice
Committee on Batteries and Switchboards
Committee on Contracts
Committee on Electric Testing
Committee on Lightning Protection
Committee on Valuation
Sectional Committees

The membership of the standing committees may consist of both representative and affiliated members of the division as no change in practice is contemplated from the methods followed in the past. This allows those especially qualified in scientific and engineering lines to be appointed to such committees. The reports of these committees will be presented to and open for discussion by all representative and affiliated members at the stated and annual meetings. The only change in practice made is in connection with the adoption of the recommendations made by the committees by letter-ballot. In the past all representative and active members voted on these recommendations. In the future only those representative members appointed by the railroads will vote by letter-ballot on recommendations for final adoption, but indirectly this vote will represent the consensus of opinion of the division as the views of the majority will likely be reflected in the letter-ballots of the representative members. Both representative and affiliated members can vote on subjects handled by the committees and presented before the meetings. The representative members will vote in the future as they have in the past, the number of votes depending upon the mileage and also upon the signals on their respective roads. A road may delegate one man or a number of men as representative members to cast the number of ballots to which it is entitled.

Roads Not Under Government Control

The question is often asked "Will railroads not now under government control or of less than 100 miles in length have the opportunity for proper representation in the work of this division?" It is the feeling among members of the R. S. A. who are on roads not under government control but who have given their time and efforts to the advancement of the association in the past, that they should be given an opportunity to continue their activities and to receive the benefits of membership in the division. As outlined above these members will have an opportunity to take part in the activities by serving on committees and by taking part in the discussions at the meetings. Furthermore, the railroads not under government control may appoint these men as their representative members and they will then be accorded the full privileges of such members.

The status of the railroads not under Federal control, including the Canadian and Mexican railroads, is exactly the same as in the past. No distinction will be made, as far as the American Railroad Association is concerned, between those roads under Federal control and those that are not.

In the past some railroads have sent their supervising signal officers (as the supervisors, inspectors, etc.) to the meetings of the R. S. A. and have paid their expenses. In the future the railroads can follow their past practice in this regard. Those members of the division in the military and naval service of the country whose dues were remitted while in the service will not be required to pay their dues for the time so employed, and on return to civil life they can resume their standing as representative or affiliated members, as the case may be. Regional committees of the Signal division will be continued in the future as in the past. In the future the Signal division will handle exclusively all work pertaining to signaling and rules for signaling. The recommendations made by this division can be made mandatory by order of the Director-General should he so desire.

Signal Division Regulations

1. The division shall include those actively connected in official or supervisory capacities with the design, construction, maintenance and operation of railway signaling devices. Affiliated members may be appointed by the Committee of Direction.

2. There shall be a committee of direction, which shall consist of 16 members, including the chairman and vice-chairmen, and a committee on nominations of five members to be elected annually by the division.

The Committee of Direction shall conduct the business of the division, and shall authorize, order, define duties, fix the number of and appoint the members of such committees as may be necessary to investigate and report their findings and recommendations upon any subject considered by them.

For the present there shall be the following committees:

Committee on Committees.
Committee on Annual Meeting Arrangements.
Committee on Editing.
Committee on Mechanical Interlocking.
Committee on Power Interlocking.
Committee on Direct Current Automatic Block Signaling.
Committee on Maintenance and Operation.
Committee on Standard Designs.
Committee on Direct Current Relays.

Committee on Alternating Current Automatic Block Signaling.
Committee on Wires and Cables.
Committee on Signaling Practice.
Committee on Batteries and Switchboards.
Committee on Contracts.
Committee on Electric Testing.
Committee on Lightning Protection.
Committee on Valuation.
Sectional Committees.

3. Regular meetings of the Committee of Direction shall be held in March, June and September, respectively, of each year, the date and place to be decided by the chairman. Special meetings of the committee may be held at the call of the chairman.

An annual meeting of the Signal division shall be held in September of each year, the time and place to be designated by the Committee of Direction, approximately three months in advance. Special meetings may be held at the call of the Committee of Direction.

4. The Committee of Direction shall offer the names of 10 representatives of members, not officers of the division, as candidates for the Committee on Nominations.

5. It shall be the duty of the Committee on Nominations to offer to the annual meeting of the division the names of one representative of a member as candidate for chairman and one for first vice-chairman and one for second vice-chairman, and the names of four representatives of members as candidates for the Committee of Direction. Every third year five representatives of members to be nominated as candidates for the Committee of Direction.

Nominations for officers or membership on the Committee of Direction or Committee on Nominations may be made by any representative of a member at the annual meeting at which such officers or members of committees are elected, provided such nominations have been endorsed by 25 representative members.

6. Officers, excepting as otherwise herein provided, shall be elected at the annual meeting of the division held in September each year, and the election shall not be postponed except by unanimous consent.

The chairman and the first and second vice-chairmen of the division shall be elected by printed ballot each year, the candidate receiving the majority of the votes cast shall be declared elected and shall hold office for one year or until his successor shall be elected.

Members of the Committee of Direction and the Committee on Nominations shall be elected by written or printed ballots; four members of the Committee of Direction shall be elected to serve for three years. Every three years five members of the Committee of Direction shall be elected; five members of the Committee on Nominations shall be elected annually.

President's Annual Dinner

C. A. Morse, president of the American Railway Engineering Association, was host to the members of the board of direction, the past presidents of the association and the members of the committee on arrangements at a dinner in the English room of the Congress Hotel at 7 o'clock last night. The party numbered 26 and included ten past presidents of the A. R. E. A., John F. Wallace, first president of the association, Wm. McNab, Hunter McDonald, W. C. Cushing and Charles S. Churchill, in addition to the five past presidents who are members of the board of direction. Three past presidents of the American Society of Civil Engineers, John F. Wallace, Hunter McDonald and A. N. Talbot were among the guests.

Rest in Peace (?)

IF WE HAD no Manual for our needs
Or Digests with their lengthy screeds,
No standard circuits, cranks or studs,
We'd all be unexploded "duds."
If it wasn't for the R. S. A.
We'd clutter up the right o' way
With experiments and hobbies punk
And spend a million bucks for junk.

II

For this signal game's no easy graft
And grief would now engulf the craft
If every mother's son had tried
To all his skill and knowledge hide,
But R. S. A. (our worthy dad)
Collected "kinks" both good and bad,
Culled out the worst and kept the best,
Adopting those that stood the test.

III

Since way back there in ninety-five,
He gathered *hombres* who were *live*.
A flock of green and vernal rubes,
Strong and husky untrained boobs,
Some brains mixed in; yes, quite a lot
And poured all in the melting pot.
The alloy of this motely clan
Produced the present signal man.

IV

In spite of all the good he's done
It looks as if his race was run,
It seems at times there's no escape,
We must go out and order crepe.
We're told, a "step-dad" (A. R. A.)
Has moved right in, prepared to stay.
In line "us orphans" then must stand
And jump sidewise at each command.

V

If our *real Pater* is laid out,
Let us romp in and stand about
And shed a salty, briny tear,
As we gang around his somber bier.
Go tell the bunch; let each one make
An effort to attend the wake,
For in the future, life will be
Dry (two ways) for you and me.

VI

Our step-dad will feed us hash galore
On handling scrap down at the store,
He'll teach us how to ballast track,
And high explosives—how to pack.
We'll read of weights, airbrakes and claims
'Till our mind gets like a pair of hames,
And warped and bent we'll lose our grip,
Our interest and our membership.

VII

Let's all buck up and keep our goat,
And dodge that wooden overcoat.
We children might be raw and crude,
But to drown us now would be real rude.
If time and thought to work we give,
Old A. R. A. may let us live,
And say and point to us with pride,
"Them's some bright brats, dodgast their hide."

VIII
Sometime the "Big Boss' U. S. A.
Will call the Railroads in and say,
This transportation job's no snap.
For the love of Mike take back your scrap.
And on that joyful judgment day,
We'll resurrect old R. S. A.
So cheer ye up, don't sit and mope,
This hunch is good, let's live in hope.

N. R. A. A. Annual Meeting

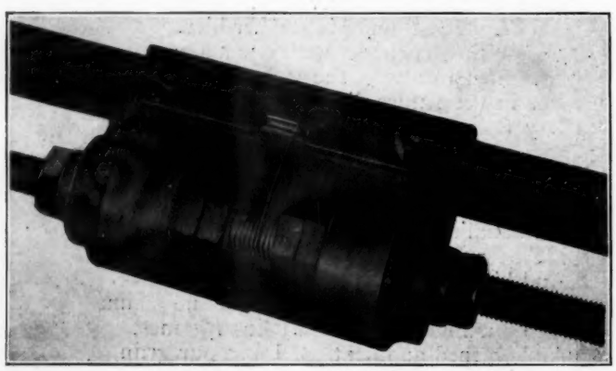
The annual meeting of the National Railway Appliances Association will be held in the dining room of the Coliseum at 11 o'clock this morning. Reports of the officers will be presented and new officers elected.

Committee Meetings of the Signal Division

Several committees of the Signal division are to hold sessions to-day and to-morrow. Committee No. 8, Alternating Current Automatic Block Signaling, will meet at 9 a. m. to-day, in Room 260, Auditorium hotel. Committee No. 4, Direct Current Automatic Block Signaling, will convene in Room 1303 of the Blackstone hotel at 9:30 a. m.. The new Committee on Valuation will meet at 9 a. m. in Room 312 at the Auditorium hotel. Committee No. 2, Mechanical Interlocking, will meet Mr. Kelloway in the lobby of the Congress hotel at 10 a. m. On Wednesday, March 19, Committee No. 3 on Power Interlocking will hold a meeting at 10 a. m. in Room 312 of the Auditorium hotel.

Weather-Proof Switch Adjustment

In order to provide protection against an accumulation of ice, snow, sand, or other extraneous substances between the sleeve shoulders and bracket of switch operating rod adjustments, the Union Switch & Signal Company, Swissvale, Pa., has designed a bracket with a cover as shown in accompanying phantom illustration. This switch adjustment bracket and cover are intercheangeable with the standard bracket supplied by this company



New Switch Adjustment Bracket

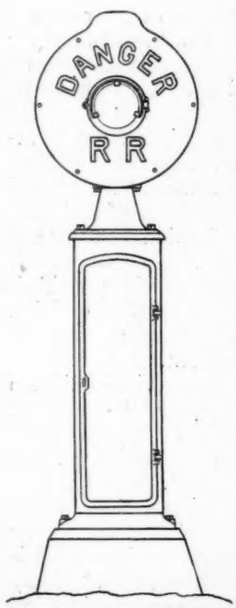
for a number of years, so that no difficulty will be experienced in replacing the older brackets by the new one wherever trouble has been experienced, or is anticipated, due to various substances becoming attached to switch connecting rod adjustments. The sheet steel cover fits snugly over the sleeves and the nuts which limit their stroke. It is held in place by a tempered steel spring bent at both ends to latch over the shoulders of the bracket.

Standard Signal and Marker Lamps

THE HANDLAN-BUCK MANUFACTURING COMPANY of St. Louis, Mo., has placed on the market a number of new lamps in which all the parts are interchangeable, with the same size oil pots and lens, and with one length of shaft on all burners. The marker lamp brackets are adjustable to any location on the train. The series of new lamps includes semaphore and train order lamps, a switch lamp with or without enamaled lens targets, engine classification markers with interior steel lens shields operated from the outside and a rear-end marker. The signal lamp conforms to the Railway Signal Association standard, while the other four lamps have been designed with the signal lamp as a basis. All the lamps have been designed to save space and to reduce the number of repair parts.

A. G. A. Railway Light & Signal Company's New and Improved Devices

THE HIGHWAY DANGER SIGNAL shown in the illustration consists of a flashing red light projected through 8⅜-in. lenses located in the center of the disc on each side of the signal head. The same burner which produces the illumination through the lenses also illuminates the white letters of the sign on the signal head so as to permit them being seen from a distance at night. The source of light consists of dissolved acetylene gas in a steel cylinder located in the housing which also supports the signal head. One cylinder of gas will operate the signal, flashing continuously from 5 to 10 months, at a reasonable annual cost, depending upon the adjustment of the burner. The height of the flashing signal can be varied by introducing pipe of the proper size between the housing and the signal head. The particular signal illustrated shows the signal head on top of the housing without any pipe extension. This design is used on highways traveled largely by automobiles where it is necessary to have the flashing signal low enough to permit the operators of automobiles to see the flashing light underneath an automobile top.



The Flashing Signal

An improvement has been made in the highway grade crossing signal lamp manufactured by this company, which consists in the adoption of an 8⅜-in. lens, which gives a beam spread of 30 deg. and through which light is projected so that it can be seen at a distance of 400 to 600 ft. in bright sunlight.

This company has developed also a new electro-acetylene color light signal for railway purposes. The lights are projected through 8⅜-in. lenses and may be operated with either a flashing or steady light. Electro-magnets are provided for controlling the gas supply to the burner. It is claimed that the indications of the signal are plainly visible in the day time and that the red light may be seen 1,800 to 2,000 ft. in bright sunlight. The electro-magnetic valve operates on about 1.8 volts and the resistance of the magnets is such that this voltage will permit a caustic soda battery to operate one valve for nearly two years.